

Discussion Document

Enabling Drone Integration

6 April 2021



Ministry of **Transport**
TE MANATŪ WAKA

Enabling New Zealanders to
flourish



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How to have your say

This discussion document seeks feedback on a proposed approach to enhance the New Zealand drone regulatory regime and enable the integration of drones into the civil aviation system. It does not represent Government policy nor does it predetermine the options the Government may consider when making final decisions.

What consultation process will be followed?

Written submissions must arrive by 5:00 pm Friday 21 May 2021.

Submissions can be sent to the Ministry at:

enablingdroneintegration@transport.govt.nz

or

Enabling Drone Integration - Consultation
Ministry of Transport
PO Box 3175
WELLINGTON 6140

You can also have your say online at www.transport.govt.nz/drone-consultation .

Publishing and releasing submissions

All or part of any written submission (including names of submitters), may be published on the [Ministry of Transport's website](#).

Your submission is public information and we will publish a summary of submissions. If you do not want your name or any identifying information to be included in anything we publish (including because you believe your comments are commercially sensitive), please indicate this clearly in your submission.

Please note that your submission is also subject to the Official Information Act 1982 (OIA). This means that other people will be able to obtain copies of submissions by making a request under the OIA. If you think there are grounds for your information to be withheld under the OIA, please note this in your submission. We will take your reasons into account and may consult with you when responding to requests under the OIA.

You must let us know, when making your submission, if you do not want us to pass details of it (including your name) on our website.

Expected next steps

Our next steps and timeline will be informed by the public consultation and post-consultation policy development. The timing of these steps is dependent on the nature of the feedback and alignment with other Government priorities.

We intend to provide an indicative timeline when presenting final policy recommendations.

Milestone	Status	When
Drone Integration paper <i>Taking Flight</i> released	Done	July 2019
Early engagement with key stakeholders	Done	September – November 2019
Public consultation	We are here	6 April – 21 May 2021
Post-consultation policy development	TBC	2021
Final policy recommendations to Minister and Cabinet approval	TBC	Late 2021
Rules development process	TBC	2022 – 2023

Glossary

Beyond visual line of sight (BVLOS)	An operation in which the remote pilot does not use visual references to the remotely piloted aircraft in the conduct of flight.
International Civil Aviation Organisation (ICAO)	United Nations specialised agency, established by States in 1944 to manage the administration and governance of the Convention on International Civil Aviation (Chicago Convention).
Joint Authorities for Rule Making on Unmanned Aircraft (JARUS)	JARUS is a group of international experts gathering regulatory expertise from all around the world with the purpose “to recommend a single set of technical, safety and operational requirements for all aspects linked to the safe operation of the Remotely Piloted Aircraft Systems (RPAS).
Notice to Airmen (NOTAM)	A notice providing pilots with general information essential for the safe and efficient operation of airplanes (such as the establishment or condition of, or change in, any aeronautical facility, service, procedure, or hazard).
RealMe, Tēnei au	New Zealand Government service to easily and securely prove online identity.
Remotely Piloted Aircraft (RPA)	An aircraft and its associated elements which are operated with no pilot on board.
Remotely Piloted Aircraft System (RPAS)	A remotely piloted aircraft, its associated remote pilot station(s), the required command and control links and any other components as specified in the type design.
Unmanned Aircraft (UA)	An aircraft designed to operate with no pilot on board, and that includes unmanned balloons, control line model aircraft, free flight model aircraft and remotely piloted aircraft.
Unmanned Aircraft Systems (UAS)	An aircraft and its associated elements which are operated with no pilot on board.
Unmanned Aircraft Vehicles (UAV)	An aircraft with no pilot on board. An Unmanned Aircraft Vehicle is a component of an Unmanned Aircraft System.
Visual line of sight (VLOS)	An operation in which the remote pilot or RPA observer maintains direct unaided visual contact with the remotely piloted aircraft.

Introduction

- 1 Drones are rapidly emerging technologies that are challenging the way we regulate the existing aviation system in New Zealand. Drones are aircraft that can be remotely piloted or flown autonomously. Drone capabilities and costs vary widely, and they come in various forms, including blimp, fixed-wing and rotary-wing. Many retail drones can be bought by anyone and operated without the need to complete training or licensing.

Throughout this document, the term **'Drone'** is used to describe Unmanned Aircraft (UA) flown under Part 101 or 102 of the [New Zealand Civil Aviation Rules](#) (the Rules).
Under the Rules, a UA is an **aircraft 'designed to operate with no pilot on board'**. This includes unmanned aerial vehicle (UAV) (also know as remotely piloted aircraft (RPAS)), unmanned aerial system (UAS), and model aircraft.
- 2 Drones can also perform a wide variety of activities never envisioned for manned aircraft. Drone technology has rapidly developed and drones are now used for many purposes, e.g. in emergencies such as fires or search and rescue operations, for surveying and mapping, agriculture, inspecting, maintaining rail and energy infrastructure, as well as more recently, for delivering goods and carrying people.
- 3 In recent years, the global drone market has increased substantially, particularly in terms of civilian applications, with significant investment in development for both hobbyist and commercial purposes. Drones are expected to continue to grow in popularity, leading to efficiency and productivity gains across various sectors. The global drone market generated USD 25.59 billion (NZD 38.29 billion) in 2018 and is estimated to grow at 8.45 percent during the forecast period, 2019-2029. The Asia-Pacific region is shown as having the highest growth rate during the forecast period.¹
- 4 The Government is aware of the rapid growth of the drone sector with data showing an increasing number of drones being purchased and operated in New Zealand. New Zealanders are finding interesting and innovative ways of using this technology in their businesses and everyday lives. This trend is not unique to New Zealand as many countries are currently grappling with the same drone uptake and related challenges.

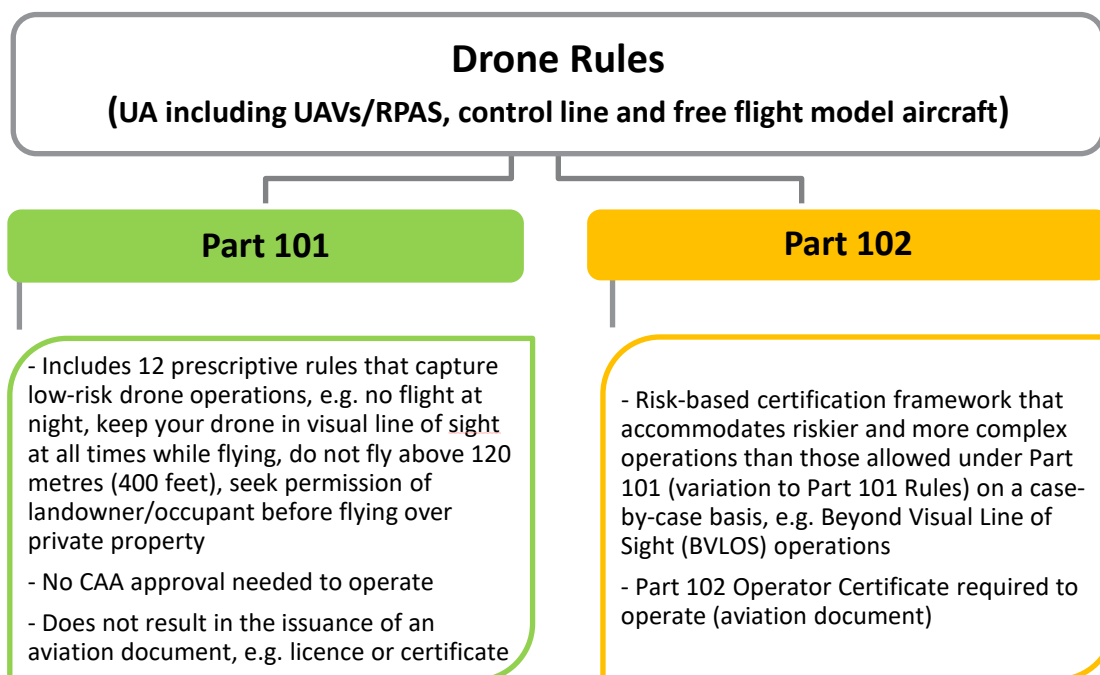
¹ See *Global Unmanned Aerial Vehicle (UAV) Market – Analysis and Forecast, 2019-2029 - Focus on VLOS and BVLOS UAVs using Satellite Communications*, BIS Research, 2019: <https://bisresearch.com/industry-report/unmanned-aerial-vehicle-market.html>

Drones in the civil aviation system today

New Zealand regulatory framework applicable to drone operations

- 5 The [Civil Aviation Act 1990](#) (the Act) and the [Civil Aviation Rules](#) (the Rules) govern and regulate civil aviation in New Zealand. Both set the minimum aviation safety and security standards in New Zealand that apply to all civilian aircraft, pilots and persons operating, including drones. The Civil Aviation Authority (CAA) oversees the safety and security standards of the aviation system.
- 6 Rules for drone operations date back to the mid-1990s. Amendments were made in 2015 to create Part 102 Rule – *Unmanned Aircraft Operator Certification* – in addition to the existing Part 101 Rule. Recognising the rapid changes occurring in the drone sector, this was intended as an interim step to manage and mitigate short-to-medium-term safety risks of more advanced drone operations.
- 7 Since 2015, New Zealand has had a two-tiered, risk-based regulatory regime for drones operations as shown in Figure 1 below. This recognises that prescriptive rules alone cannot anticipate all potential drone applications or future requirements. Unlike other countries such as Australia and the United States, no distinction is made between commercial and recreational operations. Instead the Rules consider the safety risks of an operation, rather than the purpose of the operation.

Figure 1: Current regulatory regime applicable to drone operations



- 8 The Rules and the level of CAA approval required to fly a drone are also differentiated by weight, as set out in Table 1.

Table 1: Drone differentiation by weight

Weight of drone	CAA approval
Less than 15 kilograms and operating within Part 101 limits	No approval required
15 – 25 kilograms and operating within Part 101 limits	Must be inspected and the operation approved by a person or organisation approved by the Director
25 kilograms and over <i>OR</i> Operating outside Part 101 limits	Approval required: operation must be certified under Part 102

- 9 Persons wanting to operate outside the bounds of Part 101 (i.e. when they need a variation to Part 101 Rule(s), e.g. to fly at night or operate BVLOS), must apply for a Part 102 *Operator Certificate* from the CAA. To obtain their certificate, Part 102 operators must demonstrate that they are trained, that their aircraft can be safely operated, and pass a fit and proper person test. When certified, they can enter the civil aviation system and must conduct their operations under the conditions of their certificate, as prescribed by the CAA.
- 10 This contrasts significantly with Part 101 operators who are not required to get CAA approval or to pass any test to enter and operate in the aviation system, as long as they operate their drone in compliance with the set of prescriptive Rules under Part 101.
- 11 An overview of the types of drone operations taking place in New Zealand is provided in Appendix 1.

Enforcement and penalties

- 12 The CAA investigates breaches of the Act and the Rules, can issue warnings and infringement notices under the Act and the [Civil Aviation \(Offences\) Regulations 2006](#) and initiates prosecutions for offenses. The Police can also carry out enforcement action.

- 13 Some general offences under the Act are applicable to drone operations, such as operating an aircraft in a careless manner.² Act level offences are usually major offences requiring high thresholds for enforcement.
- 14 For Rules-level offences involving breaches of the Rules, the Civil Aviation (Offences) Regulations 2006 sets out the amounts that may be imposed as infringement fees by the CAA and as fines by courts upon conviction.³

Other relevant legislative frameworks applicable to drone operations

- 15 Beyond civil aviation legislation, the misuse of drones is also addressed through the [Privacy Act 2020](#), the [Conservation Act 1997](#) and the Department of Conservation (DOC) concession regime, the [Summary Offences Act 1981](#), and the [Crimes Act 1961](#).

The **Privacy Act 2020** promotes and protects individual privacy, and establishes principles on the collection, use, and disclosure of information relating to individuals; and access by individuals to information held about them.

There are unique **privacy concerns** associated with drones equipped with cameras or other technologies, allowing personal information to be collected. They can have a significant adverse impact on privacy. Unlike phones or other cameras, drones can fly to greater heights and capture imagery that cannot be obtained under ordinary circumstances.

There are important provisions relating to drone use in the **Conservation Act 1987**. This Act promotes the conservation of New Zealand's natural and historic resources and captures the effects of Aircraft on wildlife, tangata whenua values for particular sites, and manages visitor experiences under Part 3B.

Applying the Conservation Act 1987 and the consent requirements of Part 101, all drone use on conservation land requires a permit, for both recreational and commercial purposes. For more information, see <https://www.doc.govt.nz/get-involved/apply-for-permits/drone-use-on-conservation-land/>.

- 16 Similarly, some local authorities have enacted bylaws applicable to drones. The AirShare website has a page that summarizes and provides links to local authority and DOC policies regarding drone use in public spaces throughout the country.⁴

² See sections 43, 43A and 44 of the Act.

³ Some Rules under Part 101 have been introduced with associated offences and penalties such as Rule 101.11 (controlled airspace) with an offence penalty up to NZD 2000, or Rule 101.12 (airspace knowledge) with an offence penalty up to NZD 500.

⁴ See AirShare website: <https://www.airshare.co.nz/my-flights/property-owner-consent-information>

The New Zealand drone sector and current trends

- 17 The drone sector in New Zealand includes an increasing number of commercial and recreational operators, researchers, manufacturers, consulting services firms, various associations, and training organisations.
- 18 The exact number of Part 101 operators is uncertain. We know that, as of October 2020, there are 125 Part 102 operators.⁵ This number has been steadily increasing with further growth expected in the future.
- 19 Gathering data relating to drones and their users is inherently difficult, as there are no central systems in place to track their purchase or use. To improve the evidence base around the use of and perceptions towards drones in New Zealand, the Ministry of Transport (the Ministry), the CAA and the Ministry of Business, Employment and Innovation (MBIE) commissioned a research study in 2019, *New Zealand Drone Research 2020* (the Survey), from Colmar Brunton, which was published in August 2020.⁶
- 20 The Survey estimates that, as of February 2019:
- 271,121 New Zealanders have used a drone solely or mainly for recreational purposes in the last six months
 - 7,939 New Zealand businesses or organisations have used a drone in the last six months
 - 20,721 New Zealanders have used a drone solely or mainly for business or scientific purposes
 - 156,610 drones have been used solely or mainly for recreational purposes
 - 15,322 drones have been used solely or mainly for business or scientific purposes.⁷
- 21 The Survey is just one input to inform our policy analysis to date. It aimed to gather independently sourced information on drones to supplement existing data sources (e.g. data from Government agencies such as CAA, Accident Compensation Corporation (ACC), Airways New Zealand (Airways), Police; commercially sensitive retail and manufacturer data; various industry surveys).

⁵ See List of Part 102 unmanned aircraft operators (CAA website): <https://www.aviation.govt.nz/drones/list-of-part-102-unmanned-aircraft-operators/>.

⁶ See *New Zealand drone research*: <https://www.aviation.govt.nz/assets/about-us/news/New-Zealand-drone-research-2020.pdf>.

⁷ Id. at slide 10.

- 22 Despite not knowing the exact number of users and drones in New Zealand, the Survey and other datasets confirm there is a growing trend of drone use in New Zealand, and that New Zealanders are finding interesting and innovative ways of using this technology in their businesses and everyday lives.

New Zealand takes an all-of-government approach to drones

Taking Flight: an aviation system for the automated age

- 23 In 2019, Cabinet released the vision paper *Taking Flight: an aviation system for the automated age* (Taking Flight), which sets the strategic direction of the drone work.⁸ The long-term objective set in Taking Flight is the safe integration of drones into New Zealand's civil aviation system and ultimately within the wider transport system.
- 24 Integration requires an iterative and phased approach, and is a collaborative exercise that involves working towards the best outcomes for all airspace users. In an integrated system, both manned and unmanned aircraft can operate safely and seamlessly in the same airspace and with other transport modes.
- 25 To achieve this vision, elements of the existing aviation system (e.g. infrastructure, procedures, the funding framework, policies) need to be modified to support the wide range of new capabilities and characteristic of drones. The challenge is to integrate all these diverse drone capabilities in an evolving aviation system without undue burden on current airspace users and service providers, and without compromising safety.
- 26 Taking Flight states that drone integration should be based on a set of complementary building blocks, consisting of regulation, funding and investment, infrastructure and technology, research and development.
- 27 The Unmanned Aircraft Integration Leadership Group,⁹ which is made up of senior officials from the Ministry, CAA, MBIE and Airways, develops and approves a programme of work that is consistent with the Government's vision for drone integration.
- 28 This programme of work is and must remain aligned with the strategic direction set out in the Transport Outcomes Framework that the Ministry released in 2018,

⁸ For more information on Taking Flight, visit: <https://www.transport.govt.nz/area-of-interest/technology-and-innovation/taking-flight/>

⁹ For more information on the Unmanned Aircraft Integration Leadership Group, visit: <https://www.transport.govt.nz/area-of-interest/technology-and-innovation/unmanned-aircraft-integration-leadership-group/>

which underscores that the aim of the transport system as a whole is to improve the wellbeing and liveability of New Zealanders.¹⁰

Where does this work fit in the bigger picture?

29 Additional drone-related projects are underway which contribute to the Government's wider efforts to build a productive, sustainable and inclusive national drone ecosystem that support the wellbeing of everyone in New Zealand. Appendix 2 provides details of these projects, the main ones being:

- Civil Aviation Bill that aims at modernising the Act, better incorporate drones as aircraft and related requirements, and mitigates the risk of rogue operators and better manages aviation safety and security risks¹¹
- Unmanned Aircraft Traffic Management (UTM) as a potential long-term solution for the management of drone traffic in New Zealand
- Testing and Trialling of Drone Technology that MBIE is facilitating through its Airspace Integration Trials Programme.

¹⁰ The Transport Outcome Framework identifies that the key contributors to wellbeing and liveability are resilience and security, economic prosperity, environmental sustainability, inclusive access, and healthy and safe people. For more information see: <https://www.transport.govt.nz/area-of-interest/strategy-and-direction/transport-outcomes-framework/>

¹¹ To access to the latest exposure draft of the Bill and related updates, consult the following link: <https://www.transport.govt.nz/area-of-interest/air-transport/civil-aviation/>.

An effective commitment to drone integration is necessary

- 30 The fast development of the drone industry has given rise to significant opportunities for economic, innovation and social benefits for New Zealand and prompted Government commitment to drone integration.
- 31 To better understand the potential impact of drones on the New Zealand economy and quantify the economic benefits of using drones across different sectors, the Ministry commissioned the Drone Benefit Study that was published in 2019.¹² One of the key findings for New Zealand's drone sector is that commercial drone use is estimated to be worth NZD 4.6 billion to NZD 7.9 billion over the next 25 years.
- 32 The rapid growth of the sector has caused an increasing demand for more advanced drone operations under Part 102. Such operations continue to manifest in ways that push aviation systems designed for manned aircraft and test traditional approaches to safety oversight, e.g. BVLOS and autonomous operations.
- 33 There is the key opportunity to develop a safe, sustainable, and innovative drone ecosystem and to realise the identified benefits. Government would need to take steps now to progressively cater for this growth and ensure it has the tools necessary to progress efficient and effective drone integration.
- 34 There is an evolving international approach to the regulation of drones operations. Many jurisdictions, including New Zealand's key aviation counterparts, also recognise the potential of drones and are working to enable drone integration. They are re-assessing regulations, investments, developments, and infrastructure needed to achieve this goal.
- 35 Remaining aligned internationally, i.e. maintaining some degree of consistency with overseas systems, would simplify future international cooperation and system interoperability. International engagement is critical in the absence of harmonised international standards to better understand the implications of new measures and enable the sharing of information and ideas. The Ministry and the CAA have actively engaged with overseas aviation counterparts, and participated in key drone international fora such as the [ICAO Unmanned Aircraft Systems Advisory Group](#) (UAS-AG), [Joint Authorities for Rulemaking on Unmanned Systems](#) (JARUS), and the [International Transport Forum](#) (ITF). Appendix 3 provides an overview of what ICAO and some of our key aviation counterparts are doing.

¹² See Drone Benefit Study: <https://www.transport.govt.nz/area-of-interest/technology-and-innovation/drone-benefit-study/>.

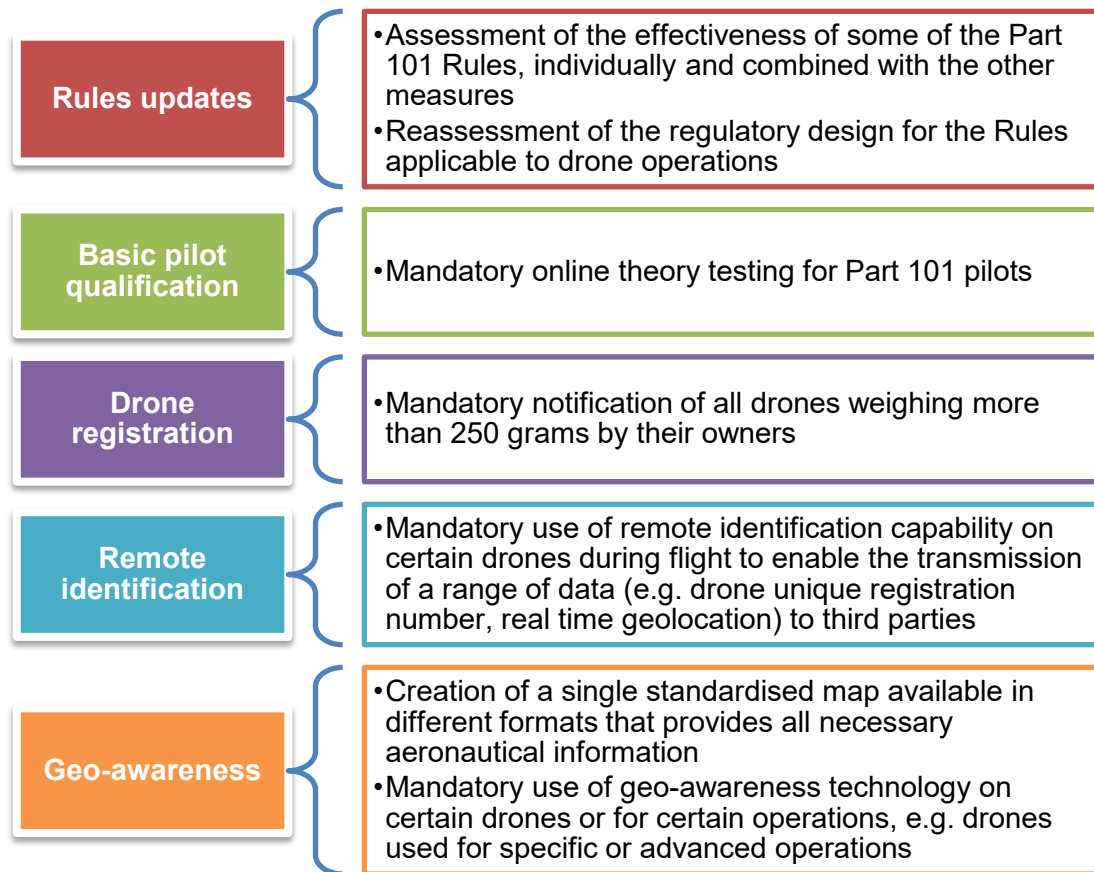
How do we propose to achieve this?

- 36 The Ministry, with the support of the CAA, has undertaken a review of New Zealand's regulatory regime applicable to drone operations to ensure it can rapidly respond to evolving technologies, applications and international practices, while maintaining appropriate levels of safety and security.
- 37 Any changes to the current system will require balancing several, sometimes opposing, objectives, including:
- enabling innovation and development in the drone sector, while supporting the interests of the wider aviation sector
 - appropriate standards of safety and security by deterring and identifying drone pilots operating illegally
 - laying the early groundwork for future integration of drones into the transport system
 - fostering social licence as there are a growing number of public concerns about drones' use, including safety and security as well as privacy and nuisance.

We propose to introduce a series of regulatory measures to support the integration of drones into the aviation system

- 38 To achieve the objectives, the Ministry and CAA have agreed to explore new policy initiatives and a series of complementary regulatory measures as shown in Figure 3. These proposed regulatory requirements build on each other, with each component contributing to an effective regulatory regime.
- 39 This series of measures provides a proportionate intervention to the size of the challenge of integration, and enables some degree of flexibility to adapt our regulatory approach in the future, if needed. This proposal has been assessed considering the effectiveness of the measures, ease of implementation, proportionality, cost efficiency, and international alignment.

Figure 3: proposed series of regulatory measures

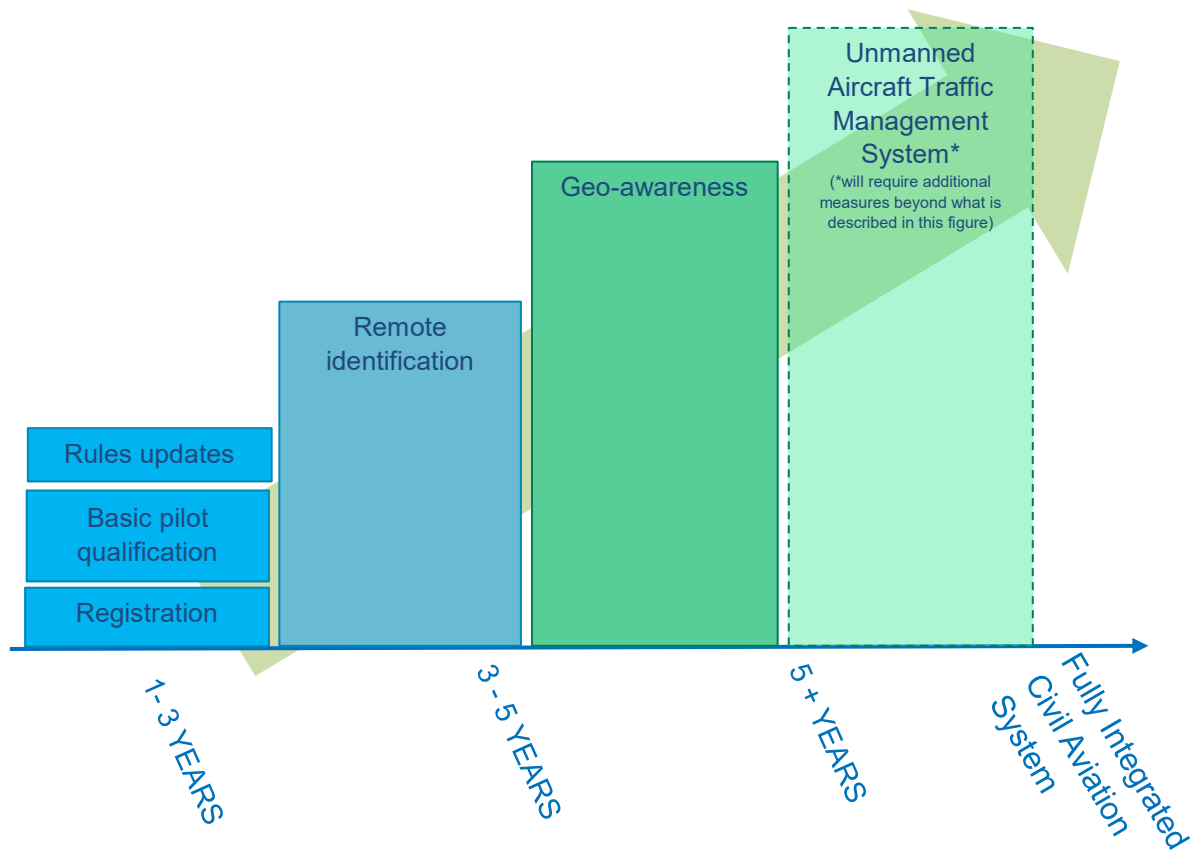


...which would be gradually implemented and whose efficiency and benefits would be maximised once they are all implemented

- 40 The Ministry proposes a phased implementation of the measures as shown in Figure 4. Although complementary, these regulatory measures require separate implementation. Each of them has distinct benefits and challenges that are identified further in the chapters of this document.
- 41 The combination of these measures maximises their respective benefits over time, and effectively addresses the identified problems and opportunities. For example, a registration system combined with remote identification (Remote ID) will maximise the ability to identify drones and enhance pilots' situational awareness.
- 42 On that basis, we suggest starting with the implementation of Rules updates, drone registration and basic pilot qualification, the main reasons being:
- the need to address the current aviation safety, security and privacy issues caused by non-compliant drone pilots, and confidence that those breaching the law can be identified

- the need to start laying the groundwork for drone integration – this starts with a clear identification of ‘who flies what’
- the need to wait for further developments on remote identification and geo-awareness standards and technology to better understand their implications and consequences as the industry matures.

Figure 4: Indicative integration timeline



43 Importantly, this proposal is also aligned with the work programmes of New Zealand’s main aviation partners. The challenges and opportunities presented by drone integration are not unique to New Zealand. To varying degrees, these are common to all jurisdictions, and as mentioned above, most of them have implemented, or are working towards implementing, similar regulatory measures to integrate drones into their transport systems.

These proposed measures would effectively address existing problems related to aviation safety and security, as well as privacy

44 As drone accessibility and popularity increases, issues of aviation safety, security, and privacy are becoming increasingly prevalent. The following four sections illustrate the overarching challenges identified through policy investigation.



There is currently a lack of compliance from drone pilots

45 Most drone users operate under Part 101, often with limited knowledge of the Rules and the aviation system. Research shows that some Part 101 operators do not know that there are Rules, or do not understand that the Rules apply to them, while some others deliberately ignore them. This can result in heightened levels of non-compliance that impact the existing levels of aviation safety and security. For example, it can increase the risk of mid-air collision between a drone and another aircraft, person and property, or raise the number of privacy-related issues.

46 Overall, the CAA-led education initiatives have proved to be effective non-regulatory options to boost education and promote drone safety. However, they have reached the limit of their effectiveness due to narrow outreach and a rapidly growing drone sector.

47 This lack of compliance is evidenced by the significant number of drone reports and complaints submitted to the CAA. Since 2015, the number of reports has gone from 120 in 2015 to 469 in 2019. From January to July 2020, the CAA received 356 reports (210 being in relation to the consent of people under flight path not obtained). Table 2 provides a detailed breakdown of CAA drone-related complaints by categories since 2015.

Table 2: Annual drone reports by type (CAA)

Report Type	2015	2016	2017	2018	2019	2020
Air proximity	22	12	38	55	45	30
Consent of people under flight path not obtained	21	56	123	190	183	384
Crash	1	5	12	8	13	20
Hazardous operation	18	39	46	46	49	38
Night flying	9	11	24	24	17	25
Operating in controlled airspace without clearance	20	43	45	67	63	32
Within 4km of aerodrome	21	22	46	60	48	62
Other	8	24	29	56	51	89
Grand Total	120	212	363	506	469	680

- 48 Similarly, Airways has also reported an increase in the number of incursions in controlled airspace that have increased from 33 in 2015 to 81 in 2019.

Table 3: Number of drone incursions in controlled airspace recorded by Airways through reports by air traffic controllers, pilots and members of the public

Year	Number of incursions
2015	33
2016	57
2017	63
2018	111
2019	81
2020	42

- 49 Finally, Police have received 2760 complaints regarding drones since 2015.¹³ If the number of complaints continues to grow, it will quickly become unsustainable and undermine public confidence.



Enforcement can be difficult and ineffective

- 50 This lack of compliance from some pilots and operators combined with current drone technology often makes enforcement difficult, and sometimes impossible, as pilots and drones cannot be identified or located. The main difficulty is identifying the wrongdoer, whether directly on the spot when only the drone can be seen at a distance (the pilot's location cannot be known if too far from the drone or intentionally hidden), or at a later stage, after receiving a complaint. This tends to compromise the effectiveness and credibility of the Rules.
- 51 More generally, the inability to enforce Rules effectively erodes the required public acceptance that is necessary to support the integration of drones into the aviation system.



Some of the current Rules are no longer fit for purpose

- 52 The Ministry and CAA must review the Rules as part of their ongoing regulatory stewardship to ensure they remain fit for purpose, while monitoring international developments.

¹³ As of August 2020.

- 53 Much has changed since the 2015 interim updates to Part 101 and introduction of Part 102. These Rules were intended to be reviewed given the fast changing nature of the drone sector.¹⁴ Since then, there has been a significant growth in the number of users and drones and an increasing demand for more complex operations.
- 54 At present, Part 102 is considered to be working as intended and is still fit for purpose content-wise, although some improvements are needed at an implementation level. As aviation participants, Part 102 operators are relatively well integrated into the current aviation system.
- 55 In contrast, some Part 101 requirements may not be proportionate to the safety outcomes they are trying to achieve. Some recurrent examples are the consent provision (Rule 101.207) or the prohibition to operate a drone within four kilometres of aerodromes (Rule 101.205), which are perceived as unjustified or disproportionate by some operators in the sector. This can inhibit the legitimate use of drones and the growth of the sector.
- 56 Moreover, Part 101 operators are currently not integrated into the current system. Part 101 operators are not aviation participants (as they do not hold an aviation document) but can operate in controlled and uncontrolled airspace which is shared by other aviation airspace users. This unconventional situation and the increase in the number of drone operations have caused a growing range of problems in the air, and are misaligned with the long-term objective of integration.



The current aviation system and infrastructure do not enable drone integration

- 57 The current regulatory framework limits the ability to integrate drones effectively into New Zealand's civil aviation system. It is not sustainable for more diverse and advanced drone operations on a wider scale, and may no longer effectively tackle the risks triggered by the growth and popularity of drones. Traditional airspace management systems are not adequate to enable rapid growth in numbers and complexity of drones entering the aviation system, now and in the future. New tools and systems that are digital and automated are needed to manage future air traffic and navigation.
- 58 Unlike manned aviation, drones often operate at low altitudes. Many future use-cases envisage drones operating over urban or suburban environments, most likely along designated air corridors. This has created new challenges (like safety and privacy), and careful planning will be needed to manage issues such as noise pollution, visual disturbance, and environmental impacts (such as disturbance of wildlife). The growing use of drones at low altitudes has also generated public

¹⁴ See Regulatory Impact Statement, Remotely Piloted Aircraft Systems: <https://www.treasury.govt.nz/sites/default/files/2015-07/ris-transport-rpa-jul15.pdf>, 2015.

concerns and suspicion, which could lead to a large, sometimes unjustified, criticism against these aircraft.

- 59 It is evident that an incremental implementation of new regulatory measures is needed to enable drone integration. If we do not lay the groundwork for drone integration, we risk falling behind international safety standards and creating barriers to innovation.

Benefits, costs and risks associated with the proposed approach

- 60 This section does not attempt to quantify and monetise any impacts of the proposed approach at this stage. While it is too early to quantify its benefits and costs, the following assessment discusses the potential economic risks, costs, and benefits of the series of measures, how they could be estimated and information gaps identified.

Short-term benefits

Reduced airspace incursions

- 61 Illegal drone incursions (i.e. unapproved drone activity) in controlled airspace have become a growing concern worldwide over the last few years, and have caused numerous airspace closures, e.g. disruptions caused at Gatwick and Heathrow airports in 2019 in the United Kingdom.¹⁵ The drone incursion that disrupted Gatwick for three days pre-Christmas cost the airport GBP 1.4 million (NZD 2.6 million) and more than GBP 50 million (NZD 95 million) to airlines.
- 62 In New Zealand, controlled airspaces are designated around 17 aerodromes with air traffic control required to maintain the safety and efficiency of aircraft operations. Drone incursions into these zones result in their closure for 15 minutes as per Airways' guidelines. There were 81 such closures in 2019.
- 63 This results in significant costs being incurred by the industry (mainly airlines and airports) and passengers due to delays in operating other aircraft. It is difficult to quantify the costs incurred as this varies depending on the location, time and delayed activity. The proposed measures would help reduce the number of drone incursions, therefore resulting in cost savings.

Reduced personal injuries and property damages

- 64 There are benefits of reducing personal injury to individuals from drones. Between 2015 and September 2020, ACC recorded 247 claims for drone-related injury

¹⁵ *Gatwick airport: Drones Ground Flights*, BBC, 20 December 2018, <https://www.bbc.com/news/uk-england-sussex-46623754>

(most involving lacerations or punctures), of which 224 resulted in a payment, total costs being NZD 88,918 (excluding GST).

- 65 As with individuals, there are likely benefits of reduced property damage from drone related incidents. However, the number and scale of these are currently unknown, with the most likely source of this information being insurance claims.

Reduced costs to society and improved social acceptance

- 66 As explained, drone use may have negative impact on society. For example, it can cause privacy (for drones equipped with cameras) and noise issues, or damage the environment (for lost or abandoned drones) and wildlife. The proposed measures would help promote responsible drone use and ensure negative impacts are minimised.
- 67 These measures are necessary to legitimise recreational and, more importantly, commercial drone use. Implementing them would improve public attitudes towards the use of drones and lead to greater acceptance as their use would be better understood and seen as safe, orderly and non-disruptive. This would eventually facilitate their integration into daily use.

Reduced investigation costs

- 68 The Police and CAA both receive calls and complaints about drone incidents, which incur costs of investigation, enforcement, and legal action. The proposed measures are assumed to improve enforcement through more effective resolution of reported incidents. This would result in cost reductions for Police and CAA over time, and eventually enable the agencies to reinvest their efforts elsewhere.

Long-term benefits

- 69 There are many opportunities for more advanced and innovative drone use, especially for commercial and freight purposes that will become available as the technology develops and drones become more commonplace. Drones have the potential to bring significant long-term benefits to the economy and environment, such as those identified in the Drone Benefit Study.

Laying the groundwork for drone integration

- 70 The proposed approach includes the foundational regulatory elements that would enable drone integration, especially for UTM. It provides the tools needed for more advanced and innovative drone services and applications, such as seamless BVLOS or automated drone operations at low altitudes, while ensuring that appropriate levels of safety, security, privacy and environmental protection are maintained.

Enabling BVLOS operations

- 71 Being able to fly BVLOS (i.e. pilots operating without having natural visual sight of their drones) remains a critical objective for many operators and is a key element of the Government's drone integration vision.
- 72 These operations allow a drone to cover far greater distances without the spotters or observers aiding its journey. Drones flying BVLOS are controlled by data provided by on-board sensors.
- 73 Under Part 101, a pilot operating a drone must maintain visual line of sight of the drone (Rule 101.209(c)(1)). BVLOS operations requires a Part 102 certificate due to the risks such operations could cause to the system. To date, the CAA has not been assured that safety risks have been appropriately mitigated to allow BVLOS operations beyond limited and controlled trials. But more tools and methodologies are being made available to enable drones operators to achieve better safety outcomes under Part 102, e.g. JARUS Specific Operations Risk Assessment (SORA).¹⁶
- 74 The CAA has started work to consider what the regulatory pathway to allowing BVLOS operations could be and what the risk tolerance for these operations is. Engagement with international counterparts, including Australia, Canada, Singapore, United States and the United Kingdom, on this is crucial to help improve the CAA certification process.
- 75 The ability to fly BVLOS could be improved if the proposed series of measures is adopted. The development and implementation of technical standards and capabilities like Remote ID and geo-awareness and the potential introduction of a UTM system would help the CAA adopt a nuanced approach when assessing Part 102 applications that involve BVLOS operations.
- 76 BVLOS operations could also be facilitated through the development of standard scenarios, such as those developed by JARUS.¹⁷ A standard scenario would cover specific types of drone operations with attributes like flying BVLOS with visual air risk mitigation, over sparsely populated areas, and in uncontrolled airspace.

¹⁶ See *JARUS guidelines on Specific Operations Risk Assessment (SORA)*: http://jarus-rpas.org/sites/jarus-rpas.org/files/jar_doc_06_jarus_sora_v2.0.pdf

¹⁷ See Standard Scenarios SORA STS-01 and -02 for Aerial Work Operations, published by JARUS (JARUS doc 06 SORA (package)): <http://jarus-rpas.org/content/jar-doc-06-sora-package> .

Creation and/or improvement of markets leading to new job opportunities

- 77 This proposal would facilitate the creation of new markets or help enhance existing ones, such as precision agriculture and civil construction. Drones present opportunities to improve freight operations, such as moving cargo within distribution centres or providing freight and courier services to customers.
- 78 This could improve the efficiency of core industry sectors in New Zealand (in terms of time and resource spent), leading to increases in productivity and economic growth. This would also likely result in environmental advantages over other modes of transport.
- 79 It would also help strengthen existing business models, create job opportunities and promote new skillsets. Drone operations also have the potential to change how people travel, with an increasing number of testing and trialling initiatives, such as those found in the Airspace Integration Trials programme led by MBIE. Eventually, this would help strengthen the social acceptance needed for increasing drone use.

Reduced barriers to access

- 80 Drones have the potential to increase the coverage and flexibility of a range of goods and services. This may improve access to these opportunities overall, but it may especially benefit people that currently face barriers to access, examples being providing goods and services to people who are less mobile or live in remote areas, or reducing the costs of accessing goods and services.

Costs

System costs

- 81 Costs to Government relate to the implementation of the measures. As described in each of the following chapters, all the measures would have administrative, digital infrastructure, education and publicity costs.
- 82 Government may wish to recover some of the costs via fees or levies for the proposed measures, particularly with drone registration and basic pilot qualification. In principle, such costs would likely be on a cost recovery basis, but alternative or additional funding options could also be considered. A key principle is that any costs should fall equitably so that participants are paying their fair share based on the risk they pose to the system and its participants. If any changes are planned for the drone sector, they will follow the established process of considering fees and levy funding changes in the civil aviation sector.
- 83 Internationally, implementation and maintenance costs vary based on existing system each country has and drone sector size. For example, Australia has recently implemented both registration for commercial users and pilot accreditation, calculating their costs for the year 2019-20 at approximately AUD

7.3 million (NZD 7.7 million).¹⁸ In the United Kingdom, the Civil Aviation Authority estimated ongoing annual costs of GBP 2.8 million (NZD 4.4 million) for their registration and drone pilot testing systems.¹⁹ This was comprised of fixed costs, registration campaign, variable costs based on volume, and functionality and service improvements. In the 2018 fiscal year, the United States Federal Aviation Administration (FAA) obligated USD 725,000 on maintaining their drone registration system and USD 520,000 towards estimating compliance with the registration regime (total NZD 1.8 million).²⁰ However some of the FAA's systems are also used for other purposes and other UAS programs.

Compliance costs

- 84 Drone manufacturers and retailers may incur costs from the imposed measures if the measures decrease drone uptake, and therefore drone sales, and if it requires them to build in additional software or hardware on board the aircraft.
- 85 Similarly, drone operators would have to spend time and resource complying with the proposed measures.

Risks

- 86 Maintaining the status quo and making changes later could be viable in the short term and give the Ministry and the CAA more time to assess the impact of potential regulatory changes on the aviation system. However, it does not support drone integration, nor creates an enabling environment for more advanced operations. It does not achieve the objectives outlined in this document, and does not enable the realisation of the identified benefits.
- 87 Moreover, the current system is not sustainable as it does not cater for the current number of drones and anticipated growth. It would become increasingly difficult to address the demands of safety, security and privacy risks over time, and we would very likely end up with more problems than those already identified.
- 88 If we do not take action now, it is likely that the Rules' effectiveness will continue to erode, as they will become further outdated as the characteristics of aviation activity shifts away from the scope of the existing framework.

¹⁸ See the Remotely piloted Aircraft Systems: Cost Recovery Implementation Statement here https://consultation.casa.gov.au/stakeholder-engagement-group/proposed-remotely-piloted-aircraft-rpa-regulatory/supporting_documents/Cost%20Recovery%20Implementation%20Statement%20%20RPAS%20Regulatory%20Charges%20%20draft%20for%20consultation.pdf

¹⁹ See 2019 Drone Registration Scheme: Charge Proposal Consultation Document CAP 1775, <https://consultations.caa.co.uk/finance/drone-registration/>

²⁰ See FAA Should Improve Drone-Related Cost Information and Consider Options to Recover Costs, <https://www.gao.gov/products/GAO-20-136>

89 The following Chapters further describe each of the proposed measures.

Questions

- Q.1 What is your view on the proposed series of measures? Are there any other alternatives you suggest we consider?
- Q.2 Would the proposed approach help achieve the desired objectives?
- Q.3 Would the proposed approach help address the problems and opportunities identified?
- Q.4 Are there any other problems and opportunities you can think of?
- Q.5 Do you agree with the proposed order of implementation of the measures?

Chapter I – Rules updates

The first part of this chapter focuses on Part 101 Rules changes, which are part of the suite of measures proposed. These rule changes will help ensure the Rules remain fit for purpose and create a more proportionate approach to maintaining aviation safety.

The second part of this chapter outlines some minor Rules changes to Part 101, which will happen in due course to clarify the Rules.

What is currently in place?

- 90 The current Rules applicable to drone operations were introduced in 2015.
- 91 Part 101 includes a set of 12 prescriptive Rules that apply to low-risk drone operations. This Part applies to drones weighing less than 25 kilograms. Under Part 101, operators do not need CAA approval to operate.
- 92 In contrast, Part 102 provides a risk-based certification framework that accommodates riskier operations than what is allowed under Part 101.

What problems are we trying to solve?



Lack of compliance from drone operators due to perception that Rules are either unclear or impractical



Difficulty in enforcing Rules as some are unclear and ambiguous



Rules are no longer fit for purpose, with some being disproportionate to safety outcomes they are trying to achieve



Limited ability to integrate drones into the aviation system

What are we proposing?

- 93 Since the Rules introduction in 2015, and the 2016 post-implementation review of the Rules, we have noted that some Rules need to be changed to ensure the system in place remains fit for purpose, effective, and proportionate.
- 94 We are not intending or proposing to make any substantive changes to the current Part 102 Rule. However, some of the proposed changes to Part 101 Rules, such as the review of the consent provision or that of the minimum flying distance from aerodromes, would have flow-on effects and enable some operators currently operating under Part 102 to do so under Part 101. Similarly, some of the other

measures described in this document, including drone registration, Remote ID and geo-awareness, would also apply to Part 102 operations.

- 95 The proposed Rules updates are strongly aligned with the Government's expectations for regulatory stewardship and will result in Rules that are:
- clear, easier to navigate, risk-based, and responsive to sector changes and innovation
 - necessary, supported by evidence and proportionate (the standard level is justified by the risk).

Major rules changes

- 96 Adopting the proposed series of regulatory measures would provide an opportunity to change, remove or relax some of the current Part 101 Rules.

Creating a standalone Rule part for drone operations

- 97 One of the major recommendations from the post-implementation review was the creation of a standalone Rule Part for drones operations.
- 98 This Rule part would exclusively capture the current Rules applicable to drones operations, and would also encompass the new regulatory requirements proposed in this document. This would greatly enhance clarity for drone operators, and ease any future changes to the Rules.

Specific changes to Rules

- 99 With the overarching goal of creating a safer, more effective, and integrated drone sector, there are a few Rules in the current regime that could be relaxed or removed, should we adopt the proposed measures in this document. This could be achieved through the introduction of basic pilot qualification that would improve education and knowledge of Part 101 pilots, drone registration and Remote ID that would allow for better enforcement, and geo-awareness that would enable better situational awareness.
- 100 This is not a comprehensive list changes. We have listed the Rules that will be most likely changed based on our analysis, industry feedback,²¹ and a more enabling technological environment.

²¹ The [Drone Safety and Regulation Engagement with Key Stakeholders](#) gathered feedback from industry on the proposals captured in this Discussion Document.

Changes to the consent provision

- 101 The consent provision (Rule 101.207(a)(1)(i)-(ii)) was introduced as part of the Part 101 updates in 2015 to minimise risk to people and property of an uncontrolled drone crashing.
- 102 The consent provision is a unique imposition on drones; neither general nor commercial aviation require such permission. However, those aircraft do have other operational restrictions that have a similar effect (e.g. some cannot operate below 500 feet); and there are a number of established airworthiness standards they must meet to provide assurance around the safety of the aircraft.
- 103 Since its enactment, the consent provision has proved to be impractical, ineffective, and inefficient because:
- 103.1 there is little to no safety benefits due to lack of compliance from operators and general misunderstanding of the Rule
 - 103.2 there is limited ability to enforce due to the inability to associate a drone to a person
 - 103.3 the Rule was not intended to address privacy or nuisance issues that may occur when a drone is operating, as other government agencies are responsible for addressing these issues.²²
- 104 This has prompted us to consider relaxing or removing this provision. Any changes to this Rule would be based on the outcome of a safety case conducted by the CAA.
- 105 If this provision is relaxed, it could be replaced with another means of managing the safety risks. A potential alternative for relaxing the consent provision could be the introduction of a 'safe distance' requirement or Rule.²³ Instead of requiring property owners consent or that of people being overflown, drones operators would have a presumptive right to fly over private property and people, provided they follow flight rules that impose minimum flying distances from people and property. They would also have to adhere to other legal requirements such as New Zealand privacy law and principles.

²² The Office of the Privacy Commission and Police deal with privacy, nuisance and harm complaints under other laws, such as the Privacy Act 2020 and Crimes Act 1961.

²³ A workshop held on 21 November 2019 as part of the Drone Forum discussed the consent provision and safe distances with stakeholders – a summary of that forum can be found on our website: <https://www.transport.govt.nz/assets/Uploads/Paper/Consent-Provision-Workshop-Summary.pdf>

- 106 Safe distance requirements have been implemented in other jurisdictions but with different distances, ranging from 25 feet (7.62 metres) in the United States to 50 metres in the United Kingdom.
- 107 Alternatively, we could decide to remove completely this provision if we consider the introduction of the series of measures proposed in this discussion as being sufficient to mitigate the identified safety and security risks. In this case, further consideration would need to be given to the impact such removal may have for other systems, e.g. public conservation land managed by DOC, where the consent provision allows DOC to manage the effects of drone use on wildlife, tangata whenua values, DOC operations, and visitor experience.

Reviewing the minimum flying distance from aerodromes

- 108 Rule 101.205 specifies that you cannot fly a drone closer than four kilometres from any aerodrome, controlled or uncontrolled, except in some circumstances.²⁴ A controlled aerodrome is one which has air traffic control services, provided by Airways.
- 109 After five years' experience with this Rule, we think it may be too restrictive at some sites. It does not consider the large variation in use of uncontrolled aerodromes across New Zealand.
- 110 Considerations could include setting a standard baseline of four kilometres from aerodromes and publishing alternative areas available for drones to operate inside four kilometres. This could lead to a graduated altitude with lower levels close to the aerodrome and in the circuit area, increasing as the distance from the aerodrome increases. Consideration would also need to be given to the protection of arrival and departure areas for other aircraft.
- 111 Whilst we are reconsidering this Rule's application, the decision will ultimately rest on the establishment of a robust safety case. A key challenge would be in ensuring drone operators know where and when they can fly, particularly if standards differ across the country. However, the potential introduction and adoption of Remote ID and geo-awareness requirements could help manage these concerns as well.

²⁴ There are two ways to fly a drone within controlled airspace - one is to get clearance from Air Traffic Control and the other is to conduct a shielded operation outside the airfield boundary.

Minor rules changes

Changes we will make to Part 101 Rules

- 112 Table 5 outlines examples of some of the high-level changes that will further clarify the Rules and ensure they are fit for purpose.

Table 5: Proposed changes to Part 101 Rules

Rule	Proposed changes
101.202 Approved person or organisation	This Rule does not work well for commercial off the shelf drones and needs to be amended to better reflect the needs of an evolving sector.
101.205 Aerodromes	This Rule needs to be rewritten and clarified for drone operators. It will help make it easier to read and understand.
101.7 Restricted, military operating and danger areas	‘Danger Areas’ should be separated out from ‘Restricted Areas’ and ‘Military Operating Area’ and ‘unmanned aircraft’ should be stipulated. There are some problems with subpart (c), and the requirement for permission and how that intersects with the other Rule parts.
101.209 Visual line of sight operation	Parts of this Rule need to be tightened, e.g. VLOS should be defined.
101.215 Aircraft mass limits	There is a need to define what gross mass is. Weight boundaries are not clear. We could consider the removal of the 15 - 25 kilograms category.

Definitions to be added to Part 101

- 113 We are proposing to introduce new definitions under Part 101 for improving clarity. Examples of definitions include: ‘barrier’ (for shielded operations), ‘visual line of sight’ (VLOS), ‘direct supervisions’, ‘direct communication’, and ‘active.’
- 114 While this list is not exhaustive, we believe that these are the definitions that would benefit users and provide the most clarity.

The introduction of ‘tethered drones’ under the Rules

- 115 A tethered drone system uses a permanent physical link, such as a cable, to provide power and communication to a drone to significantly increase its flight endurance. These systems have become popular over the last few years for many

reasons, but present some obvious safety risks, such as the cable causing another drone to crash.

- 116 Given the uptake and related risks, we believe the introduction of a new Rule under Part 101 is necessary to ensure a tethered drone is flown safely and does not endanger other drones operators and aviation participants.

Relaxing the spotter/observer requirements for First-Person View

- 117 First Person View (FPV) systems provide a video stream from a drone to an operator through a remote pilot station to extend their visual line of sight. This makes the operators feel as if they are on board the drone.
- 118 Part 101.209(c)(1) currently specifies that you must be able to see an aircraft with your own eyes to ensure safety in the air, or use a spotter/observer to do this. This rule applies to FPV because a person’s field of view is generally more restricted using equipment than if they were maintaining natural visual line of sight. However, some operators consider this is often not justified, particularly in closed conditions, and it can be unnecessarily limiting.
- 119 FPV systems continue to gather momentum, as does its acceptance, particularly for activities such as ‘drone racing’ in closed conditions. Despite this, FPV remains a difficult area to address. There are no common FPV standards and no other jurisdictions have departed from what Part 101 currently allows.
- 120 We believe this Rule could be clarified, particularly around the use of a trained and competent observer, as this is difficult to measure.

Benefits of the Rules updates

- 121 Table 6 shows the benefits that would be brought by Rules updates.

Table 6: Beneficiaries and benefits associated with the Rules updates

Beneficiaries	Benefits
Drone operators	<ul style="list-style-type: none">• Increase regulatory compliance through clearer Rules• Expand the scope of possible operations
General Public	<ul style="list-style-type: none">• Increase confidence that the aviation system is safe and secure, with clearer Rules enabling better compliance and enforcement

Beneficiaries	Benefits
Industry	<ul style="list-style-type: none"> • Benefit from a safer, more secure and innovative aviation system • Support the development of the commercial drone industry
CAA and other regulatory and enforcement authorities	<ul style="list-style-type: none"> • Improve ability to enforce Rules, with more clarity in the way Rules are written and how they apply in practice • Decrease the amount of regulatory oversight, enabling a better focus on more pressing safety concerns
Air Navigation Service Provider	<ul style="list-style-type: none"> • Increase confidence that drones are being operated safely near aerodromes • Progress drone integration and enable a more drone-friendly airspace
Government	<ul style="list-style-type: none"> • Provide assurance that the regulatory system for drones is effective, fit for purpose and aligned with regulatory best practice • Enable changes to existing Rules deemed too restrictive or disproportionate to some operators

Questions - Rules updates

Major changes to the Rules

- Q.1 Should drones have their own standalone Rule Part?
- Q.2 Should we review the four-kilometre minimum flight distance from aerodromes?
- Q.3 Should we change the requirement to gain consent to fly above property by:
- Using 'safe distances' as an alternative?
 - Relaxing the requirement in another way?
 - Removing the requirement completely?
- Q.4 Should we change the requirement to gain consent to fly above people by:
- Using 'safe distances' as an alternative?
 - Relaxing the requirement in another way?
 - Removing the requirement completely?
- Q.5 If we use 'safe distances' as an appropriate alternative to the consent provision, what distance(s) would you consider is appropriate?
- 10 metres
 - 30 metres
 - 50 metres
 - Other.
- Q.6 Are there any other major Rules changes we should consider?

Minor changes to the Rules

- Q.7 Are there any minor changes to the Rules that would make them easier to understand?
- Q.8 What do you think of the proposed minor Rules changes?
- Q.9 Are there any other changes we should consider?

Chapter II – Basic pilot qualification

We are proposing the introduction of mandatory qualification for all Part 101 pilots. This would improve drone pilots' baseline level awareness of the airspace they are operating in, and understanding of the relevant Rules and risks of flying a drone.

What is currently in place?

- 122 People operating under Part 101 are not the traditional participants in the aviation system. The Rules do not require those operating drones under Part 101 to have any training or qualification, unless the operation is conducted on or near an aerodrome. This means that there is nothing in place to ensure knowledge of the Rules and procedures around operating in uncontrolled airspace.
- 123 While numbers are difficult to accurately capture, the Survey, conducted by Colmar Brunton, suggests that up to 271,121 New Zealanders have used a drone solely or mainly for recreational purposes. This same survey suggests that 15,322 drones are being used solely or mainly for business or scientific purposes, and that most of those users operate under Part 101.
- 124 Drone pilots operating under Part 102 must undergo training based on the risks identified in their exposition in order to ensure they are competent drone pilots. They are generally compliant with the Rules and present less of a safety and security risk for the aviation participants and the public.

What problems are we trying to solve?



Lack of awareness and knowledge of the Part 101 Rules amongst drone pilots

What are we proposing?

- 125 We are not proposing a review of the existing Part 102 certification scheme or the introduction of a comprehensive drone pilot licensing scheme at this stage for Part 101 pilots.
- 126 We have considered two possible options to improve pilot competency. First, we considered continuing efforts to enhance the education initiatives and campaigns led by the CAA. As noted above, this has improved the level of compliance with the Part 101 Rules. While we think these campaigns and initiatives are useful tools, they, by themselves, have not been effective in reducing the growing number of safety, security and privacy risks.

- 127 The second option is to introduce mandatory basic pilot qualification for Part 101 drone pilots, in addition to CAA-led education initiatives. If this is implemented, it will mean that anyone operating a drone under Part 101 will have to either:
- pass a theory test and obtain a basic pilot qualification; or
 - be supervised by someone who holds a basic pilot qualification and is at least 16 years old; or
 - be tested/trained through a Part 141 or 101.202 approved training organisation.

What is basic pilot qualification?

- 128 Basic pilot qualification entails being officially recognised as a competent drone pilot who knows all the associated Rules and safety requirements for drone flight. It aims to improve Part 101 drone pilots' awareness of the Rules and understanding of the environment in which they intend to operate before they start flying.
- 129 This new measure would take the form of an online basic theory test that involves a number of questions based on specific knowledge and skills related to aviation safety, security and privacy. This online site would be a secure digital platform that would comply with New Zealand legislation and privacy principles. The test would ensure compliance with existing legal and regulatory requirements, and standard operating conditions. The basic pilot qualification would be gained if the test is successfully completed.
- 130 This would foster effective and systematic compliance, and consequently increase the level of safety and security while reducing privacy and nuisance risks within the aviation system.

Is it a form of pilot licensing?

- 131 This form of basic pilot qualification would be distinguished from traditional licensing regimes that already exist in the civil aviation system. Basic pilot qualification would include legal responsibilities and specific requirements for drone pilots as well as associated offences, but would not be an aviation document.
- 132** This proposed test should not be confused with a pilot licence or certificate such as those issued under Rule Part 61, or with a Part 102 certification, as these involve more stringent testing and higher requirements such as practical training, medical certification, and a fit and proper person test. Imposing similar requirements on drone pilots at such an early stage would be disproportionate, given the lower risk and prescriptive nature of Part 101 operations.

What would the basic pilot qualification cover?

- 133 Most Part 101 pilots do not need advanced, in-depth, aviation knowledge to operate a drone safely, but basic knowledge is required.
- 134 This test would be primarily focused on aviation safety and security, and standard operating conditions. This would include a list of questions about the Rules and relevant laws, airspace, and any potential penalties for infringements and unlawful behaviour. It would also cover privacy-related questions.
- 135 Pilots would be required to demonstrate their theoretical understanding of how to fly safely before operating a drone. A well-designed system would offer a quick and easy means of finding the information they need to know, and education materials would be developed and provided by the relevant agencies to prepare them for the test.

Who would be required to take the test?

- 136 To ensure the effectiveness of this proposed measure, mandatory testing and qualification would apply to any person operating a drone under Part 101 in New Zealand, regardless of the weight of the drone. This also includes tourists operating a drone while visiting New Zealand. However, there may be some exceptions or special authorisations. This is outlined further on in the document.

What age do I need to be to take this test?

- 137 Currently, there is no minimum age in the Part 101 Rules. Considering the variation in age of drone pilots, we propose not to introduce a minimum age for this test. We believe that any person with the necessary ability to pass the test should be able to do so.
- 138 No minimum age reflects the purpose of this qualification, to ensure that everyone flying a drone is competent. A blanket application of compulsory competency testing for all ages would ensure that everyone who can acquire a basic pilot qualification would and can do so. This would help increase pilots' awareness of the Rules, the aviation environment and associated risks.
- 139 We understand that enforcement may be an issue for children, should we introduce infringement offences for people operating without a basic pilot qualification and are under the age of 14 years old.²⁵ The current legislative framework deals with instances of children committing an offence, whereby guardians and parents are responsible for wrongdoing of children in their care.

²⁵ See section 2 Oranga Tamariki Act 1989 for definition of young child.

There is a responsibility for those guardians and parents to ensure their children are not left without responsible supervision and care.²⁶

Supervision of people wanting to fly drones

- 140 There is a broad range of people engaging with drones, including young persons, children, and people just wanting to fly a friend's drone. We believe that it would be disproportionate to require every person who wants to fly a drone to pass a test to obtain a basic pilot qualification.
- 141 We are therefore proposing that a drone pilot holding a basic pilot qualification and aged 16 years old or over could directly supervise (on a one-to-one basis) and assist a non-qualified person wanting to fly a drone. This would come with strict and specific conditions.
- 142 Direct supervision means the act of being with and watching a person, or activity, to ensure that the operation is conducted correctly and safely. A basic pilot qualification holder effectively becomes responsible for the person flying the drone and must ensure that this person operates the drone safely and abides by the Rules. Both, the supervisor and the pilot, must be aware of what supervision means, and how it is conducted. Supervision would reduce the risk of a flight being conducted unsafely without unduly burdening the sector.
- 143 This basic pilot qualification holder would have to be aged 16 years old and over to be able to supervise a non-qualified pilot. Although there is no minimum age for a supervisor in New Zealand law, we have determined that 16 years old is appropriate to have the maturity to assume responsibility over another person operating a drone, and ensure the operation is conducted safely.
- 144 We consider that the supervisor would be primarily responsible for the person being supervised, but would not be legally responsible or liable for any wrongdoings of the person being supervised, unless:
- that person is under 14 years old; or
 - the supervisor does not ensure the drone is operated safely or take reasonable steps to prevent an incident.
- 145 For those operating a drone who are over the age of 14 years old, liability would fall on the person who causes an incident or accident.

²⁶ Section 10B, in the Summary Offences Act 1981.

Who would not be required to take the test?

- 146 We acknowledge that there are drone pilots who have already undertaken some form of theory or practical training, or are members of associations requiring more knowledge to fly a drone.
- 147 We propose that holders of qualifications obtained [through Part 141 and Part 101.202 CAA approved training organisations](#) do not need to undertake this test, as long as they can prove so. The training undertaken by these organisations is more comprehensive than the basic pilot qualification proposed in this document. Making those qualification holders undertake the compulsory basic pilot qualification test would be unnecessary.
- 148 The proposed theoretical test for basic pilot qualification is not designed to replace the training provided by training organisations. It would instead constitute the first natural step that pilots would have to undertake before flying a drone if they decided not to go through training with these training organisations.

How would someone obtain a basic pilot qualification?

- 149 Obtaining the basic pilot qualification would require passing an online theory test. We believe that an online and user-friendly portal that provides all the information and education materials necessary to complete the test is appropriate.
- 150 The test would be neither lengthy nor difficult, but one that aims at improving the pilot's knowledge of the Part 101 Rules and general competency. We propose the test have an unlimited amount of attempts with a fair pass rate, and that the results from the test be valid indefinitely.
- 151 We do not think it is appropriate to require drone pilots to undertake practical lessons to learn how to fly a drone as part of this basic training.

What if I fly my drone without basic pilot qualification?

- 152 General deterrence is achieved only if enforcement is conducted at sufficiently intense levels, and in a visible manner to increase the public's perception of the risk they will be caught if they are operating illegally. The consequences that follow for a pilot operating illegally are also important.
- 153 For this reason, the proposed regulatory requirements relating to basic pilot qualification would be enacted with associated offences and penalties, which would apply in case of breach.
- 154 Examples of possible offences that would be introduced alongside the new obligations are flying a drone without a qualification, or flying a drone that is not physically marked. These would be infringement offences. Infringements are strict

liability offences and are intended to be dealt with outside of the criminal courts. The penalty for an infringement offence is a fixed fee, which is issued “on the spot” by an enforcement officer. If an individual challenges or fails to pay this fee, then the matter will be heard by a court. Infringement offences cannot result in a criminal conviction.

- 155 Some offences like that of communicating false information are already covered under the Civil Aviation Act and would apply to anyone breaching the related provisions.

Benefits of a basic pilot qualification

- 156 There are immediate and lasting benefits of basic pilot qualification as listed in Table 7.

Table 7: Beneficiaries and associated benefits of basic pilot qualification

Beneficiaries	Benefits
Drone operators	<ul style="list-style-type: none"> • Provide an official platform to find verified and up to date information about Rules and requirements to fly drones in New Zealand
General Public	<ul style="list-style-type: none"> • Provide assurance that drones are operated in compliance with the Rules and the law • Increase assurance that drone pilots are aware of their obligations and know how to operate a drone safely • Increase confidence that the aviation system is safe and secure
Industry	<ul style="list-style-type: none"> • Benefit from a safer aviation system (e.g. decreases the risk of accidents and incidents) • legitimise drone use
CAA and other regulatory and enforcement authorities	<ul style="list-style-type: none"> • Improve drone pilots’ education and compliance with the Rules • Improve the ability to take action against non-compliant pilots when required
Air Navigation Service Provider	<ul style="list-style-type: none"> • Increase confidence that drone pilots are competent and aware of their regulatory obligations resulting in a reduction in airspace incursions
Government	<ul style="list-style-type: none"> • Increase assurance that drone pilots are aware of Rules and legislation and are operating accordingly • Foster a more cohesive aviation system

What are the likely costs and challenges associated with implementing basic pilot qualification?

- 157 It is difficult to estimate what the costs would be at this stage. To determine the costs of basic pilot qualification, we would have to consider both the implementation costs (e.g. creation of the test and related materials, implementation of a digital system and potential additional resources to run it) and the ongoing costs related to maintenance of the system. We would also need to estimate the number of pilots concerned, i.e. the user base, which is a tenuous exercise at present given the absence of registration requirements.
- 158 By comparison, some CAA Rule education campaigns, which include the creation of websites setting up rules and promotion, have cost the CAA close to NZD 100,000. This cost has included the website and promotional campaign, which would be included in the pilot competency testing, but does not take into account the digital platform for the test and the ongoing upkeep of the system.

Questions - Basic pilot qualification

- Q.1 Should we introduce basic pilot qualification for Part 101 drone pilots?
- Q.2 What impact would a basic pilot qualification likely have on you?
- Q.3 What format should this test take?
- a. Electronic/online theory test
 - b. Paper based written theory test (at a provider)
 - c. A practical examination of skill and a paper based written theory test (at a provider)
 - d. Other
- Q.4 Should there be a minimum age for basic pilot qualification?
- Q.5 Do you agree with the proposed special authorisations given to Part 141 and Part 101.202 approved training organisations?
- Q.6 Is there any other special authorisations you would like to see? Why?

Chapter III – Drone registration

We are proposing the introduction of mandatory registration of drones and their owners. Registration would enable us to associate a drone to a person, to build accurate datasets on the number of drones and operators in New Zealand. Registration is the first natural step to enable drone integration into our civil aviation system, along with Remote ID and geo-awareness.

What is currently in place?

- 159 The Rules do not require drones or their owners operating under Part 101 to be registered. Drones, as unmanned aircraft, are specifically exempted from Part 47 *Aircraft Registration and Marking* requirements.
- 160 Operators certified under Part 102 must maintain an exposition which records the drone or drones they intend to operate. Whilst the CAA maintains this list of operators, it is not considered as a formal registration system.²⁷ Details collected include the number of drones and the specifications of each drone to be used, including any identification system used on the aircraft.
- 161 Some Part 102 operators are required to have their drones registered and display markings in accordance with Rule Part 47 if the CAA considers it necessary in the interests of aviation safety. This is generally for larger drones.

What problems are we trying to solve?



Lack of compliance from drone pilots
Inability to communicate directly with drone owners



Inability to link a drone to a person, i.e. inability to identify who flies what, making complaints often unenforceable



Limited ability to integrate drones into the civil aviation system
Difficulty in collecting accurate data and managing risks accordingly

²⁷ See the List of Part 102 unmanned aircraft operators here: <https://www.aviation.govt.nz/drones/list-of-part-102-unmanned-aircraft-operators/>

What are we proposing?

- 162 We are proposing to require owners of drones to register their drones with the CAA (more specifically with the Director of Civil Aviation). This would be a new requirement under both Parts 101 and 102 of the Rules.

What is drone registration?

- 163 Registration means owners of drones are required to provide specific information about their aircraft and themselves to the Director of Civil Aviation before the first flight. Once a drone has been registered, an owner would be required to physically mark it with a unique identification number issued by the CAA.
- 164 Under the Act, 'register' and 'registration' have specific meanings, and result in issuing an 'aviation document'. To obtain this document, a fit and proper person test is required and the CAA has to decide on a case-by-case basis if an application can be approved. Once approved, the aircraft is entered on the New Zealand Aircraft Register by the CAA.
- 165 Imposing these requirements on drone owners at this early stage and in the current context would be disproportionate and too onerous not only for them, but also for Government. This position is justified mainly due to the prescriptive nature of Part 101 operations and the significant number of drone operators.
- 166 To keep drone registration simple and distinct from traditional aircraft registration, we propose that the Rules be updated requiring drone owners to 'notify' their drone and relevant information to the CAA. The proposed notification requirement would not involve the issuance of an aviation document, and the drones being registered would not form part of the New Zealand Aircraft Register.
- 167 Drone registration would not significantly change or impact on the current certification process under Part 102. This includes maintaining the Rule for operators who have been required to register their drone under Part 47 and appear on the New Zealand Aircraft Register.

Who would be required to register a drone?

- 168 We propose that anyone who is legally entitled to possess a drone would be required to register with the CAA by providing information about themselves and the drone before the first flight.
- 169 In most instances, this would be the owner²⁸ of the drone. An owner can be either:

²⁸ This is distinct from the operator of a drone or the person piloting the drone. However we expect that in most instances the owner and operator or pilot will be the same person.

- an individual person; or
- an organisation such as a company, government department or an incorporated society or club.

170 We suggest a minimum age of 14 years for an individual to register a drone. Anyone younger than 14 years would need a parent or guardian to be registered as the drone owner. The rationale for this is that it is the youngest age for which a person can be issued with an infringement notice. This is consistent with the definition of a young person and ensures the law can be applied. Also, 14 years is generally used as the minimum age for authentication of identity services, e.g. RealMe.²⁹

What drones would need to be registered?

171 We are proposing that all drones weighing 250 grams or over should be notified. Drones being operated under both Part 101 and 102 would have to be notified. For those being operated under Part 102, notification would be part of the certification process.

172 At present, 250 grams is considered by the vast majority of our aviation counterparts, including the United States, Canada, the United Kingdom, Australia and European Union Member States (through European Aviation Safety Agency regulations), as being the appropriate minimum safety threshold for registration purposes, as shown in Appendix 3.

173 The rationale for introducing a minimum threshold for drone registration is based on studies carried out internationally. The literature on drone weights notes that factors such as maximum speed, capacity, and the level of pilot competency can influence the level of risk alongside the weight of a drone.³⁰ It has shown that a drone that weighs 250 grams and above is able to transfer 80 Joules of terminal kinetic energy capable of injuring a person if it falls from a height of 120 metres.³¹

174 We propose to exclude very small drones that present a negligible safety risk for the environment they operate in from being registered. These drones often have very limited capabilities and performance (e.g. not able to carry a payload, minimum speed, and battery life), and a short life span³². Given the low safety

²⁹ www.realme.govt.nz – RealMe allows you to access multiple online services with one username and password, and securely prove who you are online.

³⁰ See “Mass Threshold for ‘harmless’ drones”, Anders la Cour-Harbo, International Journal of Micro Air Vehicles.

³¹ Ibid.

³² *New Zealand drone research* (June 2020), pp.28-30: <https://www.aviation.govt.nz/assets/about-us/news/New-Zealand-drone-research-2020.pdf>.

risks of drones weighing less than 250 grams, we believe that introducing this threshold is proportionate to the desired safety outcomes and will avoid overregulation.³³

- 175 In New Zealand, it is estimated that nearly a quarter of the drones operated recreationally, and four percent commercially, weigh under 250 grams.³⁴ We believe that, as long as their pilots follow the Rules and fly safely and securely, these drones do not need to be registered.
- 176 Aligning our regulatory framework with that of aviation counterparts would provide some form of certainty to the industry, especially manufacturers, and help ensure future harmonisation and systems' interoperability.
- 177 This minimum threshold could be changed in the future if further evidence or data emerges to warrant a higher or lower weight threshold. Conversely, drones under 250 grams may become more prevalent as technology advances and becomes smaller and cheaper.

What drones would not be required to be registered?

- 178 We propose that the following drones would not need to be registered:
- drones used solely indoors
 - drones weighing less than 250 grams
 - drones operating within Model Flying New Zealand (MFNZ) designated areas and under supervision of MFNZ.
- 179 MFNZ gives members special privileges to operate model aircraft and drones. Model aircraft generally operate under the Rules Parts 101 and 102, and comply with MFNZ's Rules and Codes of Practice that are reviewed regularly to ensure compliance with the Rules. Model aircraft are flown by members of model aircraft clubs in specifically designated areas (i.e. danger areas) under the supervision of MFNZ.
- 180 We propose that if a model aircraft is solely being flown within a designated area and under supervision of MFNZ, then registration of the drone would not be

³³ In addition to safety reasons, some overseas regulations also take privacy and personal data into consideration, security risks, and international alignment. For example, EASA regulations require drones under 250 grams to be registered if they have a camera or sensor that is able to capture personal data and the drone is not considered to be a toy. See Easy Access Rules for Unmanned Aircraft Systems (Regulations (EU) 2019/947 and (EU) 2019/945): <https://www.easa.europa.eu/document-library/easy-access-rules/easy-access-rules-unmanned-aircraft-systems-regulation-eu>.

³⁴ See *New Zealand drone research*, June 2020, pp.22 and 26, <https://www.aviation.govt.nz/assets/about-us/news/New-Zealand-drone-research-2020.pdf>.

required. However, if a model aircraft is flown outside of a designated area, then it would have to be registered.

How long would registration be valid for?

181 At this stage, we propose that drone registration be a one-time event for each drone. However a drone owner would be required to keep their details up to date and notify the CAA of any changes such as a sale or transfer to another person, loss, destruction, or no longer in use. This obligation to maintain accuracy of information would come with associated penalties in case of non-compliance.

What information would need to be provided when registering?

182 To ensure the effectiveness of the system, the following information would need to be provided:

- drone information including make, model, serial number, weight and type of drone, purchase date (if applicable), or if custom made, photograph of the drone, plus any other relevant information
- personal details of the owner such as name, physical address, date of birth, identification numbers (e.g. passport, driving licence), contact details including phone numbers and email address.

Who would be responsible for administering the registration system?

183 The CAA would be responsible for maintaining the registration record and administering the overall system.

184 Even though this new system would not officially form part of the Civil Aviation Register, it would be set up and managed in compliance with the Public Records Act and New Zealand privacy law and principles.

What would the system for drone registration look like?

185 The registration system would need to be fit-for-purpose to accommodate the volume of owners and drones. It also needs to be flexible enough to cater for any future regulatory changes. Importantly, we want to ensure it can accommodate other measures we are proposing in this document like Remote ID and potentially be interoperable with overseas registers.

186 We believe this new system should have the following features:

- digital, automated and user-friendly (i.e. accessible both online and via mobile)

- developed as a platform that supports the use of open Application Programming Interface (API) to ensure that multiple apps can be linked to the system
- enable identity authentication to protect against identify fraud, e.g. through integration with RealMe.

Who would have access to the information in the registration system?

- 187 We would consider providing either full or limited access to the registration system to law enforcement authorities like New Zealand Police, as required. This would provide them with the ability to access the registration system or request specific information to identify the owner of a drone when required for enforcement purposes.
- 188 We could consider making certain information available publicly like the New Zealand Aircraft Register. Drone owners could authorise this on either an opt-in or opt-out basis during the registration process. For example making some registration information publically available would facilitate the recovery of lost drones such as [Drones Reunited](#) in the United Kingdom.

What do I get once I have registered my drone to the CAA?

- 189 A unique identification number would be assigned to each drone once the registration process is completed (similar to a licence plate for a car).
- 190 The owner would be then required to ensure the identification number is adequately displayed on the drone and that it remains so, e.g. requiring permanent label, engraving or marking with indelible ink.
- 191 This would also apply to Part 102 operators unless they have been required by the Director to register and display marking under Part 47.

What happens in case of non-compliance with the notification requirements?

- 192 As within any regulatory system, there would be intentional or non-intentional cases of non-compliance. We believe that most people are willing to do the right thing, so we expect most drone owners to comply with the registration requirements. However, we also expect some drone users to be deliberately non-compliant, as to avoid being identified or caught by enforcement agencies.
- 193 To ensure a good functioning system, the regulatory requirements would be introduced with associated offences and penalties, which would be applied in case of non-compliance. These would include for example the failure to notify the drone to the CAA before first flight, the failure to display identification number or markings on drone before flight, and that of notifying changes of information.

194 We anticipate most of these new offences to be infringement offences. Any new offences and penalties would be created under the Rules and apply alongside other applicable penalties for breaches against Part 101 or Part 102 and within existing provision in the Act.

Benefits of drone registration

195 There are both immediate and flow-on benefits as a result of implementing a registration scheme for drones as listed in Table 8 below.

Table 8: Beneficiaries and benefits associated with drone registration

Beneficiaries	Benefits
Drone owners and operators	<ul style="list-style-type: none"> • Encourage responsibility and accountability • Enable direct communication of important safety, education, and operational information such as NOTAMs or rule amendment • Enable an owner or operator to recover a lost or missing drone
Public	<ul style="list-style-type: none"> • Increase confidence that the aviation system is safe and secure • Ensure that drones are being operated within the law and that their owners can be identified
Industry	<ul style="list-style-type: none"> • Benefit from a safer aviation system • Aid commercial arrangements relating to regulatory compliance, maintenance, health and safety, and insurance • Build accurate datasets to inform planning and infrastructure to support sector growth
CAA and other regulatory and enforcement authorities	<ul style="list-style-type: none"> • Enable direct communication of important safety, education, and operational information such as NOTAMs or rule amendment • Improve education initiatives, including the development of more targeted tools • Improve the ability to identify operators and/or take action against non-compliant pilots/owners when required • Improve the gathering of information and data on drone use to support management of regulatory systems and risk assessments

Beneficiaries	Benefits
Air Navigation Service Provider	<ul style="list-style-type: none"> • Increase confidence that non-compliant owners and operators can be identified, and where required appropriate enforcement action taken
Government	<ul style="list-style-type: none"> • Ensure that the regulatory system for drones remains effective, flexible, fit for purpose and aligned with the all of Government long-term strategy, regulatory best practice and evolving international obligations • Constitute the first step toward achieving integration, needed for other things like Remote ID • Improve services provided by other government agencies (e.g. applying for permits to fly in a national park)

What are the likely costs and challenges associated with implementing drone registration?

- 196 It is difficult to estimate what the cost of registration would be at this stage.
- 197 If a registration system is introduced, there would be costs associated with its implementation (e.g. setting up an automated system able to issue a unique identification number to each drone being notified), maintenance (e.g. resourcing), and ongoing administration (i.e. education and enforcement). The need for the registration system to be automated may have higher initial set-up costs, but lower ongoing administration costs.
- 198 A fee may be charged to drone owners for registration. However any potential new fee should not become a barrier or disincentive to comply.
- 199 If a new fee for drone registration is to be introduced, we would need to consider whether to charge either per drone or per owner and whether it should be a one-off or annual fee.

Questions - Drone registration

- Q.1 Should we introduce the proposed drone registration system? Why?
- Q.2 What impact would drone registration likely have on you?
- Q.3 What do you think of the proposed system design (e.g. digital platform) and requirements (e.g. identity authentication)?
- Q.4 Should there be a minimum weight threshold for registering a drone? If so, is 250 grams appropriate? If not, what would be an appropriate weight threshold and why?
- Q.5 Should certain drones not need to be registered (such as drones flown solely indoors or within specific designated areas (e.g. Model Flying New Zealand sites) from registration? What other drones should not need to be registered and why?

Chapter IV – Remote Identification

This Chapter elaborates on the concept of Remote ID as one of the proposed regulatory measures. It is intended to provide a preliminary overview of our thinking and a conceptual understanding of the measure. Any potential implementation would be considered once drone registration and basic pilot qualification are in place.

We are proposing to introduce Remote ID requirements for certain drones under the Rules. This measure would enable the identification of aircraft information (while preserving operators' personal information) in near real time and complement the proposed registration measure. It aims at enabling greater operational capabilities and progressing drone integration. It would also help address safety, national security and law enforcement concerns around drone use.

What is currently in place?

- 200 There are no rules or standard in place requiring electronic identification and tracking of drones operating under Part 101 of the Rules. Although Part 102 does not expressly require it, the CAA may impose it as a condition of a Part 102 Certificate as part of the unmanned aircraft operator exposition.

What problems are we trying to solve?



Lack of compliance caused by lack of drone pilots' accountability



Inability for enforcement authorities to take action against drone misuse due to inability to remotely locate and identify a drone and its operator



Lack of support for more advanced drone operations and inability to integrate drones into the civil aviation system

What are we proposing?

- 201 We are proposing to mandate the use of Remote ID capability on certain drones.
- 202 The objective is to support drone integration by improving situational awareness for drone pilots and aviation participants sharing the airspace. It would underpin information sharing for more advanced operations, like BVLOS operations. It would also provide a new form of capability for law enforcement and increase drone pilots accountability.

What is Remote ID?

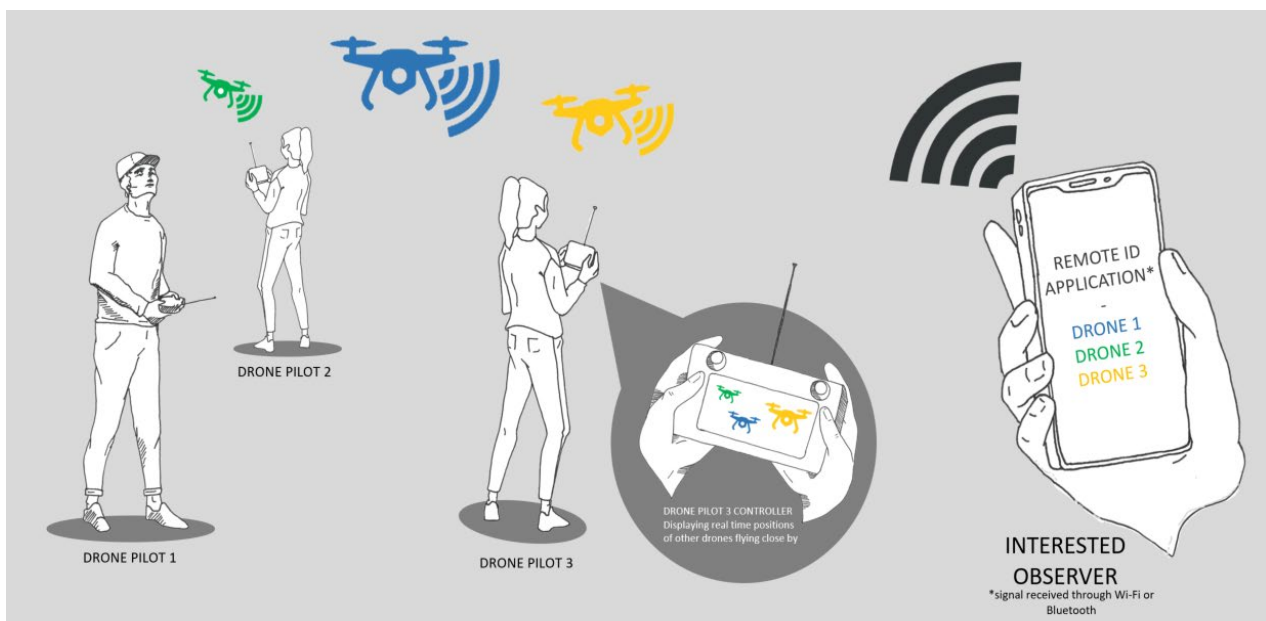
- 203 Remote identification refers to a system on board a drone that will enable the sending of identification information during a flight to other parties that can directly receive it, without needing physical access to the drone.
- 204 Remote ID technology can provide snapshots of near real-time information about:
- drone identification (e.g. serial number, registration number)
 - flight characteristics (location, altitude, speed, direction)
 - latitude and longitude of the control station and drone
 - a Coordinated Universal Time (UTC) time mark
 - an indication of the emergency status of the drone (e.g. lost-link or downed aircraft).
- 205 Remote ID systems are already available and many drones are already equipped with this technology. Remote ID systems are either embedded into drones' software or hardware (e.g. small beacons, transponders). Most large manufacturers have already included some form of Remote ID capability in their drones. For example, many current models of DJI drones are equipped with receivers that enable operators to detect nearby aircraft and avoid them. Overall, the technology is still developing and, as of today, is not a fail-safe solution.
- 206 When required, the information sent from the drone would assist the CAA, law enforcement authorities and other security agencies in identifying a drone and locating its operator. This functionality is particularly important for drones that are breaching the Rules in a given area, or those operating in restricted airspace near aerodromes and other sensitive facilities.
- 207 It could also enable the general public to identify a drone in a way that would protect the privacy of the owner or operator's information. Remote ID would provide more transparency while still ensuring drone owners, pilots, businesses and customers' privacy.
- 208 The registration system proposed in Chapter III of this document would be the basis to provide the information necessary to identify drones and their owners when required (through a unique identification number). Remote ID requirements would thus build on this measure, and be implemented after the set up of the registration system. This concept would be developed in adherence with New Zealand privacy principles and legislation.
- 209 The ability to remotely identify drones in flight is considered an important step in the development of the commercial drone industry and drone integration. The

ability to identify a drone remotely would better enable BVLOS operations through near real time information sharing and help address the safety and security challenges that come with these operations. More generally, Remote ID would also play a key role in the development of a potential future UTM system.

A technical standard for Remote ID has been developed

- 210 The United States FAA commissioned ASTM International, an international standards development organisation, to develop a technical standard for Remote ID. The Committee F38 on Unmanned Aircraft Systems, with the support of industry experts, published the F3411 Standard Specification for Remote ID and Tracking at the end of 2019.
- 211 This standard is currently supported by the CAA. However new technical standards may be developed, and further analysis will be required to determine what is appropriate for New Zealand.

Figure 5: Remote ID – simplified representation of how it works



Benefits of Remote ID

- 212 The primary benefits of introducing Remote ID requirements in New Zealand are listed in Table 9.

Table 9: Beneficiaries and benefits associated with Remote ID

Beneficiaries	Benefits
Drone owners and pilots	<ul style="list-style-type: none"> • Improve situational awareness and mitigates the risk of collision • Facilitate more advanced operations, e.g. BVLOS
General Public	<ul style="list-style-type: none"> • Provide the assurance that drones can be reported if required • Increase social acceptance and confidence that the aviation system is safe and secure
Aviation sector	<ul style="list-style-type: none"> • Benefit from a safer, secure and innovative aviation system • Support the development of the commercial drone industry
CAA and other regulatory and enforcement authorities	<ul style="list-style-type: none"> • Improve the gathering of information and data on drone use to support management of system development, safety promotion, and risk assessment • Improve the ability for authorities to deal with complaints and support enforcement action when required
Air Navigation Service Provider	<ul style="list-style-type: none"> • Improve situational awareness, mitigates the risk of collision and unnecessary disruptions for airspace users • Increase confidence that drones are being operated safely and in accordance with the Rules
Government	<ul style="list-style-type: none"> • Provide assurance that the regulatory system for drones is effective, fit for purpose and aligned with regulatory best practice • Enable changes to existing Rules deemed too restrictive or disproportionate to some operators • Constitute a key building block for drone integration, including a possible UTM system

What are the likely costs and challenges associated with Remote ID?

- 213 It is difficult to estimate the costs associated with mandating Remote ID as it is still at an early stage.
- 214 We anticipate that the costs will be mainly incurred by drone manufacturers. However, most drones are already equipped with this functionality, and we expect this capability to become more common in newer models.

- 215 For operators of drones without such capability, there would be the cost to equip with Remote ID and meet the standard. However, we anticipate it to be minimal as the majority of drones operating in New Zealand should already be equipped with some forms of Remote ID capability. Moreover, most drones currently operating either for commercial or recreational purposes have a life span averaging one to two years.³⁵ By the time a Remote ID technical standard is adopted and new rules are enacted, most drones would have had to be replaced, and so the costs of retro fitting a drone might not arise.
- 216 For Government, the main costs would be in setting up interoperable and future proofed systems and infrastructure.
- 217 If the requirement for Remote ID is progressed, we would need to consider the following challenges:
- adoption of a technical standard for Remote ID technology
 - interaction between Remote ID requirements and other measures, such as registration and any potential future drone traffic management system
 - scope of Remote ID requirements, i.e. who, what, where, and when
 - interaction and interoperability of Remote ID with other forms of electronic conspicuity
 - potential privacy and security considerations
 - any transition period, including requirements for existing or custom drones.

Questions - Remote ID

- Q.1 Should we consider introducing Remote ID? Why?
- Q.2 What impact would Remote ID likely have on you?

³⁵ See *New Zealand drone research*, June 2020, pp.28-30, <https://www.aviation.govt.nz/assets/about-us/news/New-Zealand-drone-research-2020.pdf>.

Chapter V – Geo-awareness

Geo-awareness rules, tools, technology and capabilities on drones can significantly improve situational awareness for drone operators and help increase compliance. Together with drone registration and Remote ID, it constitutes a key building block for drone integration.

This chapter aims to help understand what geo-awareness is at a conceptual level and why it is important. The adoption of geo-awareness, as one of the proposed regulatory measures, would follow drone registration and basic pilot qualification.

What is currently in place?

- 218 Drone pilots and operators are required to be aware of the airspace they are operating in and comply with the Rules. They need to know where they can and cannot fly, and when applicable, what airspace they need to request clearance for (e.g. controlled or special use airspace).
- 219 At present, pilots and operators have access to aeronautical information such as air navigation charts, and can use mobile applications and online services like AirShare and AirMap to help them with their flying. Currently there is no official map that has been specifically designed for drone usage and to meet the needs of their users.
- 220 There is currently no regulatory requirement that supports the use of geo-awareness capabilities on drones. Some manufacturers have incorporated geo-awareness capabilities and features into their drone hardware and flight software. Current technology is still at an early stage of development.

What problems are we trying to solve?



Lack of compliance from drone's pilots due to poor situational awareness triggering inadvertent breaches of airspace



Lack of support for more advanced drone operations and inability to integrate drones into the civil aviation system

What are we proposing?

- 221 We are proposing to require:
- the creation of a single standardised map available in different formats (i.e. paper or digital) that provides all necessary aeronautical information for drone operations to all pilots and industry; and

- the use of geo-awareness technology on certain drones or for certain operations, e.g. drones used for specific and/or advanced operations (e.g. BVLOS).

What is geo-awareness?

- 222 Geo-awareness is primarily the pilots or autonomous platforms' ability to directly know, perceive and understand the environment in which they operate. This ability is developed through knowledge of airspace based on specific sources of information, e.g. rules, aeronautical maps.
- 223 With respect to drones, a geo-awareness system alerts the pilot when the drone enters or is about to enter a prohibited zone in near real time so, that he/she can take immediate action to prevent a potential breach of airspace limitations. It works both in two and three dimensions (geographic area and altitude) and is based on satellite navigation networks, such as GPS.
- 224 Geo-awareness must be distinguished from the concept of geo-fencing. Geo-fencing is a sophisticated system that actively prevents drones from entering into restricted zones. Put simply, drones equipped with such a function cannot enter or take-off from geo-fenced areas (in which drone flights could raise other safety or security concerns). As with geo-awareness, geo-fencing is a technological system in drone software used to protect high-risk or sensitive areas, such as aerodromes, prisons, conservation lands or crowded places (e.g. major events) from improper drone use – whether intentional or accidental.
- 225 Conversely, geo-caging capability can contain a drone in a designated area by preventing it from flying outside of the zone. For example, it could be used by businesses to prevent their drones from unintentionally leaving their property boundary or by model aircraft clubs to ensure their members remain within their operating area.
- 226 Geo-awareness, geo-fencing and geo-caging technology is still developing and is not fail-safe. Manufacturers have indicated that it cannot be guaranteed in all conditions. As with Remote ID, it is currently not a fool proof solution. Some operators may deliberately override it and find a way to circumvent flight restrictions imposed by the manufacturer on its products.
- 227 There is considerable investment internationally, led by industry, in developing this technology. Some manufacturers have pre-empted regulatory change and voluntarily equipped their drones with geo-awareness and geo-fencing software.³⁶

³⁶ For example, DJI uses GPS receivers on its drones to disable its drones from flying in designated areas. Its drones also come with automatic altitude limits.

Benefits of geo-awareness

228 Geo-awareness has the potential to improve aviation safety, security, and help further integrating drones in our civil aviation system. The key benefits of introducing geo-awareness requirements are listed in Table 10.

Table 10: Beneficiaries and benefits of geo-awareness

Beneficiaries	Benefits
Drone owners and pilots	<ul style="list-style-type: none"> • Improve situational awareness and mitigate the risk of entering prohibited zones or sensitive areas • Reduce the risk of accidents and incidents involving other aircraft, people and property in high-risk areas
General Public	<ul style="list-style-type: none"> • Increase social acceptance and confidence that the aviation system is safe and secure
Industry	<ul style="list-style-type: none"> • Benefit from a safer, secure and innovative aviation system • Support the development of a commercial drone industry
CAA and other regulatory and enforcement authorities	<ul style="list-style-type: none"> • Increase compliance by drone pilots • Reduce complaints from inadvertent breach of airspace
Air Navigation Service Provider	<ul style="list-style-type: none"> • Improve situational awareness • Mitigate the risk of collision and unnecessary disruptions for airspace users • Increase confidence that drones are being operated safely and in accordance with the Rules
Government	<ul style="list-style-type: none"> • Provide assurance that the regulatory system for drones is effective, fit for purpose and aligned with regulatory best practice • Constitute a key building block for drone integration, including a possible UTM system

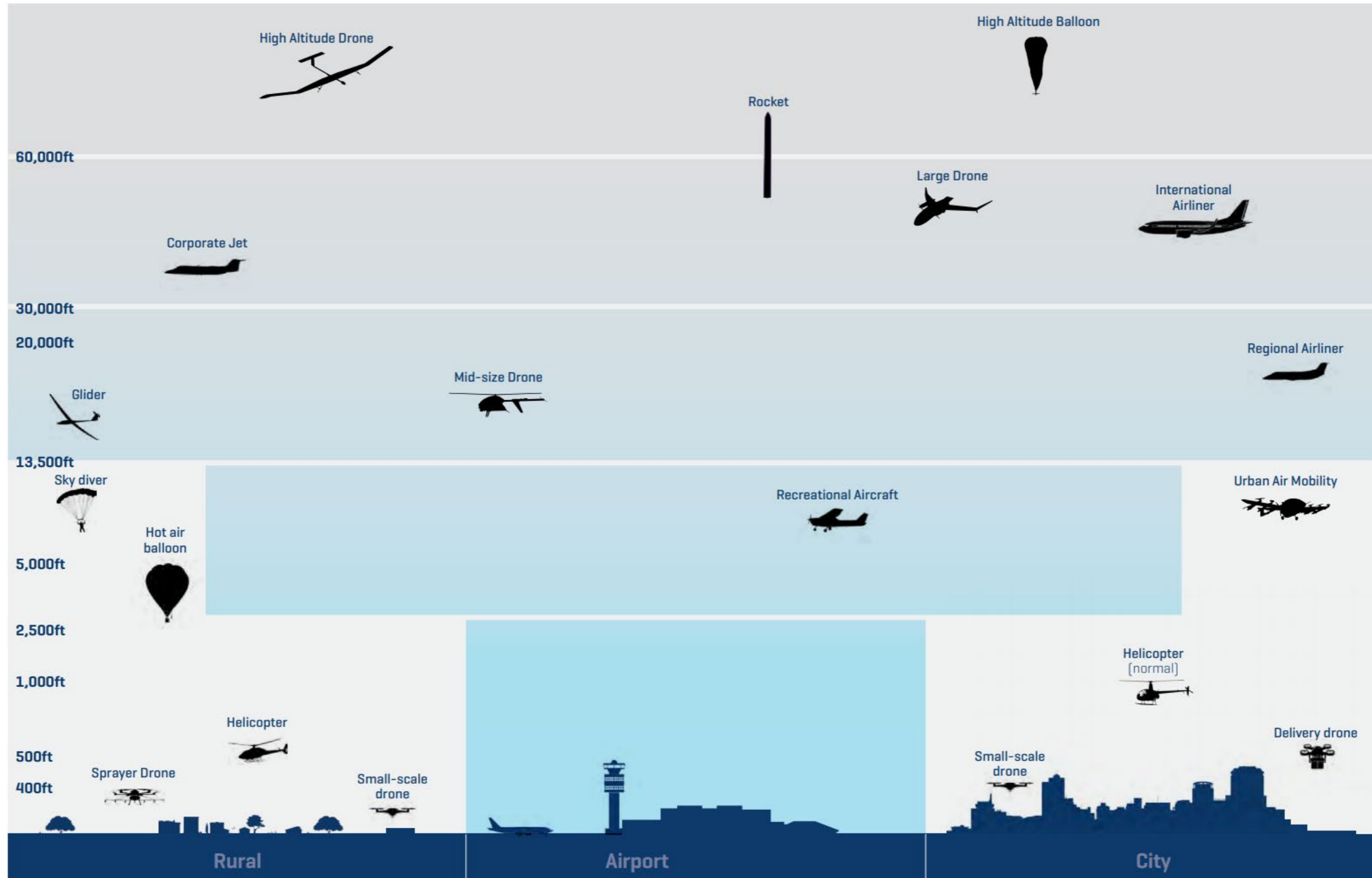
What are the likely costs and challenges associated with implementing geo-awareness?

- 229 We anticipate that the majority of costs would fall initially on Government if an approved drone navigation map that can be used by pilots and software developers is designed and updated.
- 230 The main costs of geo-awareness would be associated with the requirement for certain drones to be equipped with the appropriate technology, e.g. software being regularly updated. We expect these costs would mainly fall on manufacturers and be absorbed into the price of the drones. We anticipate a decrease of the costs as the technology advances and becomes more widely available.
- 231 Some costs may fall on drone owners and operators where their drones are not equipped with such capability and need to be upgraded. Given the current lifespan of drones, we anticipate that the majority of new drones will have this capability by the time new rules come into effect.
- 232 If we opt to introduce geo-awareness requirements, we would need to work through the following considerations:
- scope of geo-awareness requirements, i.e. who, what, how, where, and when
 - determine what zones should be geo-fenced and what criteria and policies should apply
 - interaction between geo-awareness requirements and other measures and any potential future drone traffic management system
 - potential privacy and security considerations
 - any transition period, including requirements for existing or custom made drones.

Questions - Geo-awareness

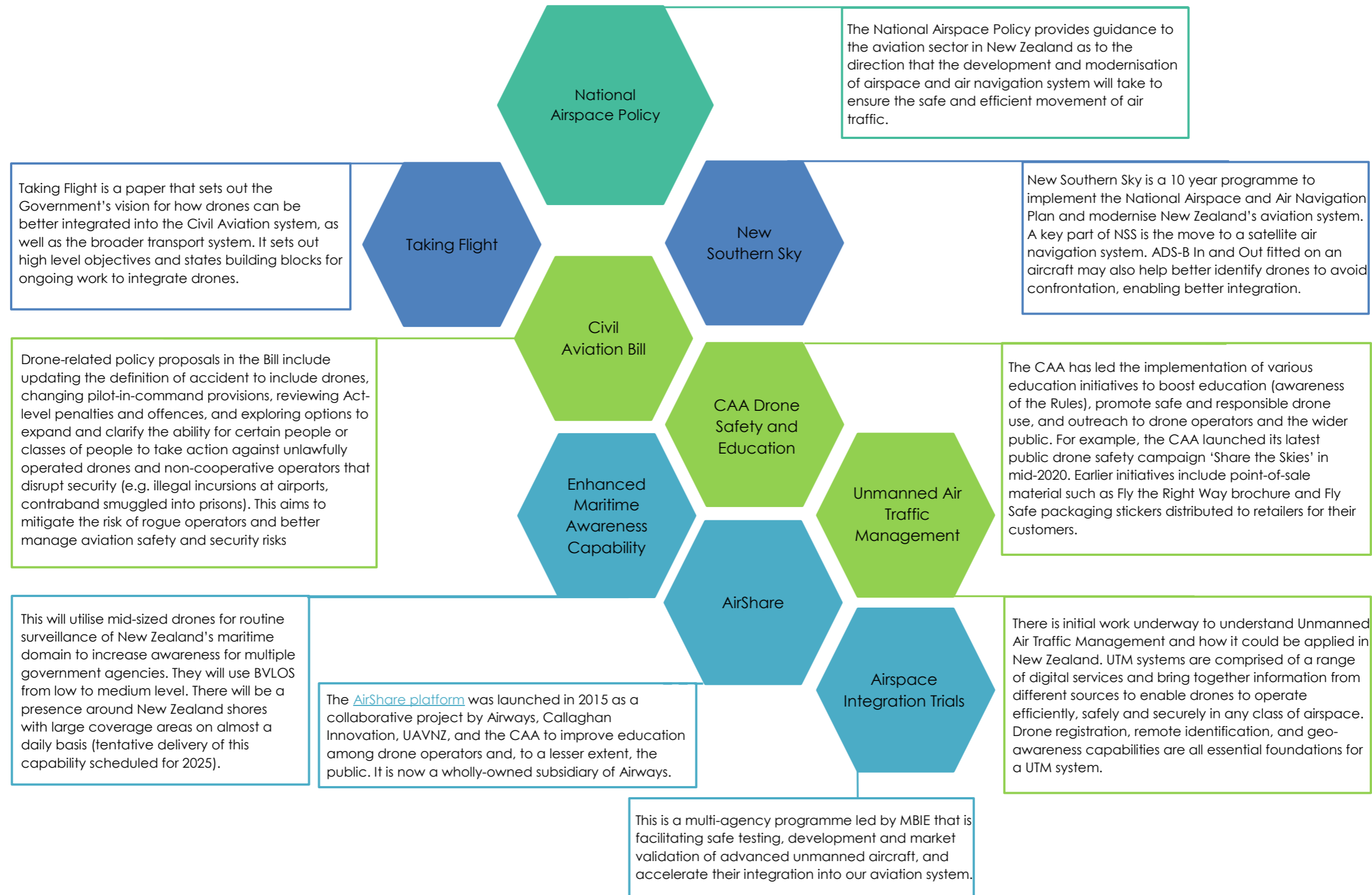
- Q.3 Should we consider introducing geo-awareness? Why?
- Q.4 What impact would geo-awareness likely have on you?

Appendix 1 – Drone operations in New Zealand



Source: Taking Flight: An aviation system for the automated age

Appendix 2 – Drone projects across government



Appendix 3 – Overview of ICAO and what others are doing

International Civil Aviation Organisation (ICAO) update

The International Civil Aviation Organization's (ICAO) [Remotely Piloted Aircraft Systems \(RPAS\) Panel](#) is developing Standards and Recommended Practices (SARPs) for certificated international drone operations. These are operations that are within controlled airspace and conducted using instrument flight rules in non-segregated airspace and at aerodromes from 2031.

Related to this, ICAO's [Unmanned Aircraft Systems Advisory Group \(UAS-AG\)](#) is developing guidance material for smaller drones as these operations fall outside ICAO's primary mandate and UTM. The UAS-AG consists of ICAO Member States, including New Zealand, and aviation industry partners. As part of this work it has published [Model UAS Regulations](#) and supporting Advisory Circulars to provide a template for Member States to adopt or supplement their existing drone regulations.

ICAO is also working with other groups (e.g. standard organisations like EUROCAE) to develop the specific technical standards that support ICAO SARPs. Other groups, such as JARUS, are focused on the aircraft systems of drones generally used in smaller and local operations, which are outside the scope of ICAO's RPAS Panel mandate.

What others are doing

Internationally, drone rules are changing rapidly. The information in this table is based on best efforts to collate the information available at the time of writing (November 2020).

	Registration				Competency Testing			Identification		Minimum age	Special authorisations
	Where are they up to?	Who/what?	Cost	Validity	Who?	Cost	Validity	Physical and electronic ID	Remote ID		
Australia Civil Aviation Safety Authority (CASA)	Online registration and accreditation schemes to be introduced together Implementation from 30 September 2020 for commercial drones and March 2022 for recreational drones	<ul style="list-style-type: none"> All drones used commercially Recreational drones above 250g 	Free until 30 June 2021. Pricing to be reviewed for 2021/22 financial year.	1 year	<ul style="list-style-type: none"> Accreditation: pilots must take the test if drone weighs more than 250g. The test will consist of a short video followed by a quiz. Takers have unlimited attempts to pass. <i>Will be available March 2022 and required by 20 May 2022.</i> Remote pilot licence (RePL) or remotely piloted aircraft operator's certificate (ReOC) for commercial operations with drones more than 2kg 	Free	3 years	Unique manufacturer's marking (e.g. serial number barcode or QR code) linked to drone at registration; or if not available a CASA unique identifier can be affixed	No current requirements (CASA indicated might be introduced in future, but if so unlikely to require retrofitting of existing drones)	For registration: <ul style="list-style-type: none"> 16yrs Operators under 16yrs must be supervised by an accredited person above 18yrs For accreditation: <ul style="list-style-type: none"> 16yrs 	Model aircraft association members operating at CASA-approved airfields (approximately 1,000 sites) will not need to register their drones or gain an accreditation.
United States Federal Aviation Administration (FAA)	Online or paper-based registration system in place since 2015 Testing requirements in place since 2017 for drones under 25kg used commercially (Part 107)	All drones between 250g and 25kg	USD5 per drone	3 years	Remote pilot certificate (Part 107) for drones under 25kg used commercially: knowledge test that includes 60 question multiple choice test to answer in 2 hours at FAA-approved Knowledge Testing Centre	USD150 (Part 107)	2 years	Operators must: <ul style="list-style-type: none"> mark each of their drones with unique registration number before operating (one number for all drones) be able to provide FAA registration certificate 	RID required on all registered drones operating in the US airspace (standard RID UAS and limited RID UAS) Notice of proposed rulemaking (NPRM) – RID of UAS – aiming for publication by end of 2020	For registration: <ul style="list-style-type: none"> 13yrs for recreational use 16yrs for commercial (Part 107) For remote pilot certificate: <ul style="list-style-type: none"> 16 yrs 	Community-based organisations that have a set of safety guidelines that were developed in coordination with the FAA have a special authorisation. The FAA to issue guidance for how it will recognize community based organizations.
Canada Transport Canada	New rules published January 2019. Online registration system implemented from 1 June 2019	<ul style="list-style-type: none"> All drones between 250g and 25kg Drones over 25kg do not need to be registered, but operators must have special flight operations certificate (SFOC) 	CAD5 per drone	New drones or on transfer of ownership (registration number remains the same)	<ul style="list-style-type: none"> Basic Pilot Certificate required for basic operations: online small basic exam with 35 multiple choice questions to answer in 90 minutes (65% to pass) Pilot certificate – Advanced Operators required for other flights below 25kg: online small advanced exam with 50 multiple choice questions to answer in 60 minutes (80%) to pass 	CAD10 (per attempt)	2 years	Operators must mark (write, label, engrave) drones with unique registration number before flying	No current requirement	For registration: <ul style="list-style-type: none"> 14yrs For pilot certificate: <ul style="list-style-type: none"> 14yrs for basic operations 16yrs for advanced operations (unless supervised by a qualified person) 	Model Aeronautics Association of Canada is exempt from the requirements set out in Part IX of the <i>Canadian Aviation Regulations</i> , i.e. registration and certification.

NOT GOVERNMENT POLICY

	Registration				Competency Testing			Identification		Minimum age	Special authorisations
	Where are they up to?	Who/what?	Cost	Validity	Who?	Cost	Validity	Physical and electronic ID	Remote ID		
<p>United Kingdom Civil Aviation Authority (CAA)</p>	<p>New rules effective from 30 November 2019</p> <p>UK CAA will review and implement any changes from April 2021</p>	<ul style="list-style-type: none"> All owners of drones between 250g and 20kg Operators of drones above 20kg must obtain an exemption before any flight can take place 	GBP9 per operator	1 year	<p>Operator gets a Flyer ID on passing Online theory test/online education package based on a new Drone and Model Aircraft Code mandatory for all drone operators</p> <ul style="list-style-type: none"> 20 multiple choice questions Pass mark of 16 Unlimited number of attempts 	Free	3 years	Operators must label each drone with unique digital <i>Operator ID</i> issued by UK CAA (one code for all drones)	Mandatory Remote ID will be introduced at a later stage (details not yet decided)	<p>For registration:</p> <ul style="list-style-type: none"> 18yrs <p>For competency testing:</p> <ul style="list-style-type: none"> None, but children under 13 can only register with a parent or guardian present 	<p>Exemptions from the competency test apply to:</p> <ul style="list-style-type: none"> holders of current CAA permissions or exemptions for drone operations operators holding an achievement certificate issued by a UK model aircraft association <p>Exemption from registration and education apply to control line model aircraft flying</p>
<p>European Union European Aviation Safety Agency (EASA)</p>	<p>Member States must implement a digital national registration scheme by Jan 2022 according to the requirements set out in the implementing regulation. The schemes must be interoperable within the EU, and allow for mutual access and information exchange</p>	<ul style="list-style-type: none"> All drones above 250g Drones below 250g that i) have a sensor able to capture personal data (unless classed as toy) or ii) are able to transfer energy of more than 80 joules to a human in the event of a collision Drones above 25kg or flying beyond visual line of site (BVLOS) must be registered, alongside other authorisation and certification requirements 	Member States to determine	Member States to determine	<ul style="list-style-type: none"> For flying drones between 250-900g and those up to 25kg flown far from people: online training course and online foundation test For flying drones up to 4kg flown close to people: same as above with additional theoretical knowledge exam to receive <i>Certificate of Remote Pilot Competency</i> 	Member States to determine	Member States to determine	Operators must display unique digital registration number issued by EU Member State on each drone	Every drone in the open category >250g must be equipped by July 2022	<p>For registration:</p> <ul style="list-style-type: none"> 16yrs for Open and Specific category (Members States can lower it) <p>For competency testing:</p> <ul style="list-style-type: none"> 16yrs for Open and Specific category (Members States can lower it) Any age if supervised by an operator above 16yrs that passed test. 	Member States can issue special authorisations to model clubs and associations to deviate from EU regulations (should be received by June 2022)
<p>Singapore Civil Aviation Authority of Singapore (CAAS)</p>	<p>New rules since January 2020</p>	All drones weighing more than 250g must be registered before use	SGD15 per drone (i.e. per label) Fee collected at the point of purchase of the registration label	One-off registration fee	<p>UA Basic Training Certificate (UBTC) required for recreational or educational operations using drones weighing more than 1.5kg but not exceeding 7kg</p> <ul style="list-style-type: none"> Online theory training conducted by any CAAS-approved UA Basic Training organisation. <p><i>* Application and enforcement dates for UA Basic Training will now come into effect from 1 June 2020 and 1 February 2021 respectively</i></p> <p>UA Pilot Licence (UAPL) required for commercial activities/business purposes, or for drones weighing more than 7kg</p> <ul style="list-style-type: none"> Theory test administered by CAAS Practical assessment conducted by an Authorised Flight Examiner within an approved organisation 	UBTC: based on CASS-approved UA Basic training Organisations. Initial application for a UAPL is SGD500, and theory test being SGD125	<p>For UA Basic Training: one-off</p> <p>For UAPL: 4 yrs (proficiency check)</p>	Operators must display label with unique operator registration number issued by CAAS on each drone (labels to be purchased online or over the counter at designated post offices)	No current requirement	<p>For registration:</p> <ul style="list-style-type: none"> 16yrs <p>For UA basic training and UA Pilot License:</p> <ul style="list-style-type: none"> 16yrs Below 16 yrs, users may operate under the supervision of another person who is at least 16 years old and has obtained the UA Basic Training Certificate, or holds a UAPL. 	None

Appendix 4 – Part 101 Civil Aviation Rules applicable to drones (rpa) operations

Part 101 Rules	Description
101.7 Restricted, military operating, and danger areas	A person must not fly in special use airspace without the permission of the controlling authority of the area
101.13 Hazard and risk minimisation	A person operating an unmanned aircraft must take all practical steps to minimize hazards to person, property and other aircraft.
101.202 Approved person or organisation	An approved person is one who has appropriate knowledge of airspace designations and restrictions.
101.205 Aerodromes	A person must not operate a remotely piloted aircraft or a free flight model aircraft on or within 4 km of an aerodrome.
101.205 Aerodromes	A person may fly within controlled airspace if they have gotten approval from the relevant aerodrome operator or ATC unit.
101.207 Airspace	A person operating an unmanned aircraft must avoid operating in airspace above people or property unless you have prior consent.
101.207 Airspace	A person operating a remotely piloted aircraft must not operate the aircraft at any height above 400 feet above ground level.
101.209 Visual line of sight operation	A person who operates an aircraft to which this rule applies must at all times maintain visual line of sight with the aircraft; and be able to see the surrounding airspace in which the aircraft is operating; and operate the aircraft below the cloud base.
101.211 Night operations	A person must not operate a remotely piloted aircraft or free flight model aircraft at night unless it is indoors or a shielded operation.
101.213 Right of way	A person who is operating a remotely piloted aircraft, control line model aircraft or a free flight model aircraft must ensure the aircraft that the person is operating gives way to, and remains clear of, all manned aircraft on the ground and in flight.
101.215 Aircraft limits	A person must not operate a remotely piloted aircraft, a control line model aircraft or a free flight model aircraft with a gross mass of more than 25 kg.

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